WORLD CONSERVATION STRATEGY

CANADA

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WORLD CONSERVATION STRATEGY - CANADA
A REPORT ON ACHIEVEMENTS IN CONSERVATION

Prepared by

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EXECUTIVE SUMMARY

This report describes the progress in conservation that has been achieved by federal, provincial and territorial governments in Canada and which contributes to the World Conservation Strategy (WCS). The multiplicity of jurisdictions in Canada is such that a comprehensive examination of all activities in conservation would be impracticable. Instead, the range of achievements is illustrated by highlights from regional, national, and international programmes. No attempt has been made to address the many actions of industry, non-government organizations and private citizens, although a few outstanding examples have been included to illustrate the importance of these contributions.

As an introduction to the report, Canada is portrayed as a fortunate nation, vast in size, rich in natural and human resources, and with numerous advanced institutions that enable governments, industry and the public to manage and utilize these resources to good effect. Despite these advantages, however, Canada has encountered many problems in the course of development. Soil degradation, loss of prime cropland, water shortages and deteriorating water quality, airborne pollutants and many types of environmental contamination are among the more serious concerns. Furthermore, emphasis on often well-intended sectoral policies has led us away from a much needed integrated approach to the management of our resources. As events have shown, sustained use of a resource cannot be achieved in isolation, because resources and their management and utilization invariably are linked to other essential processes and systems in the biosphere.

It is precisely this need for a broader, more integrated approach to economic development through the conservation of living resources that underlies the WCS, a 72-page document published in 1980, that was endorsed by Canada and 33 other countries in 1981. The WCS was commissioned by the United Nations Environment Programme (UNEP) and prepared by the International Union for the Conservation of Nature and Natural Resources (IUCN) with support from the World Wildlife Fund.

Achievements in conservation are presented in this report according to the framework of the WCS, beginning with the objectives of conservation and the priority requirements for their attainment. The first objective, the maintenance of essential ecological processes and life-support systems, entails six requirements that embrace some of Canada's most pressing problems: preservation of cropland, maintaining the productivity of resource lands, preventing soil degradation, protecting watersheds, maintaining fishery systems, and controlling pollution. Numerous legislative and regulatory instruments at all levels of government have curbed many problems, but much remains to be done.

For the second objective, to preserve genetic diversity, Canada has a notable record of achievements that date back over a century, and include systematic approaches to assessing and protecting species and their varieties, representative ecosystems and important habitat. However, the work is far from complete.

Sustainable utilization of species and ecosystems, the third objective, calls for regulatory instruments, reductions in incidental losses, maintenance of habitats and proper treatment of forest resources in particular. Again, Canada's achievements are impressive, but not always sufficient to meet this objective.

Canada has made progress in addressing the 16 priority national actions recommended by the WCS, although a comprehensive national conservation strategy has not been attempted. In almost every instance, the specific national actions have also been responded to by the provinces and territories who have extensive responsibilities for living resources in Canada. These actions include adoption of anticipatory and cross-sectoral policies, assessment of development actions, review of institutions and agencies responsible for conservation, and improvements in research, training, public participation and education. Canada's special responsibilities for wetlands and the northern environment, both of which have global significance, are examined in additional sections on these topics.

Canada's international liaisons and traditionally strong support for overseas development are illustrated in many achievements under 14 priority international actions. Canada has been an active participant in many important conservation conventions. Bilateral and multilateral assistance and cooperative programmes have been directed into reforestation projects (especially in the tropics), restoration of degraded environments (especially in drylands), fisheries, gene conservation, and development of related policies and programmes. Special attention has been paid to the regulation and protection of marine resources, international river basins and the global atmosphere, and to the reduction of pollution.

Canada's achievements in conservation are numerous. Much emphasis has been placed on the establishment of legislative and regulatory instruments that function within Canada's complicated jurisdictional structure. These instruments have been applied with some success, but there remains a need to develop more effective links across sectors, and across domestic and national boundaries. The governments and people of Canada have an important part to play in the global cooperative effort to ensure that conservation achieves its objectives.

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"The wonder of the world, the beauty and the power, the shapes of things, their colours, lights and shades; these I saw. Look ye also while life lasts".

from an old tombstone in Cumberland, England

INTRODUCTION

The Dimensions of Canada

Canada is a vast country. Its 9.98 million km^2 extend over more than 41 degrees of latitude and 88 degrees of longitude, and its coastline is a remarkable 243 789 km, three-quarters of which encompass islands. The geological base is diverse and anchored on the massive Canadian Shield of mineral-rich Precambrian rocks. Sedimentary rocks underlie vast areas of rolling western plains, and rise abruptly, to peak at 5955 m above sea level in a series of north-south mountain ridges that cradle some of the world's most spectacular scenery. To the east, sedimentary and older rocks have been sculptured by the elements to form the Appalachians, the St. Lawrence lowlands, and the varied landscapes of the four Atlantic provinces. A continental and northern setting has exposed the land repeatedly to the rigours of glaciation.

Climates have contributed much to Canada's diversity of wildlife and landscapes. Mean annual temperatures range from 10°C in southern British Columbia to -18°C in the arctic archipelago. Temperatures below -40°C have been recorded in all territories and provinces except Prince Edward Island; temperatures exceeding 40°C have been recorded in 7 of our 10 provinces. Within a single province, British Columbia, rainfall ranges from 206 mm a year, near Ashcroft, to 4387 mm in Ocean Falls.

Nearly 48% of Canada is occupied by 10 distinct forest regions. Tundra takes up another 28%, peatland 12% and grasslands 3%. In addition, almost 8% of the land surface is covered by lakes, which hold 15% of the world's lake water. The landmass is bordered by a continental shelf that harbours rich marine life.

The multiformity of natural environments is reflected in the range of species and ecosystems, both managed and unmanaged. These living resources have immense importance in the Canadian economy. Agriculture, forestry and fisheries make major contributions to commodity trade. Employment in the resource sectors is of equal importance. Almost one-quarter of the entire Canadian labour force is employed in resource dependent activities at the primary and manufacturing levels. The sustainability of resource utilization is thus of paramount importance to the economic and social well-being of Canada's 25 million people, three-quarters of whom are urban dwellers.

Conservation in Canada

Conservation programmes have a long history in Canada: in 1985, we celebrated a hundred years of national parks, in 1986, a hundred years of agricultural research; in 1987, it will be a hundred years since the establishment of the first sanctuary for waterfowl. Our natural resources are managed for the most part by provincial and territorial agencies, equipped and staffed to meet the particular needs of each region. Numerous institutions have been established to ensure that decisions about use of resources consider social, economic and environmental consequences, and do not overlook the views of governments, industry and the Canadian public. A host of scientific and technological facilities operated by governments, industry, universities and private and cooperative enterprises provide the knowledge on which these decisions can be based.

Our development, however, has had its own consequences, typical of industrialized, developed nations around the world. In our haste to attain personal, corporate and national wealth, we have not always questioned the meaning of wealth. We have been less than prudent in the way we dispose of unwanted materials. In using our resources, we have often ignored their relationships to the natural settings we call ecosystems. And we have not fully recognized that these ecosystems are but components of larger, interconnected systems that collectively form Barbara Ward's "Spaceship Earth".

As a result of our shortcomings, we are faced with a number of important environmental and resource issues that threaten our social and economic well-being. Of particular concern, either regionally or nationally, are:

Moraine Lake lies at the head of the Valley of the Ten Peaks in Banff National Park, Alberta.
Canadian Government Office of Tourism.

- loss of prime cropland, especially around urban centres;
- degradation of soils through loss of organic matter and nutrients, through contamination with toxic chemicals, airborne pollutants and pesticides, erosion and other factors;
- water shortages, particularly in the prairies, and deteriorating water quality in the Great Lakes basin and elsewhere;
- environmental contamination, in particular the trans-boundary movements of airborne pollutants; and
- the need for integrated resource management.

This report will document the initiatives that have been taken, by governments in particular, to address these and other issues. Perhaps the greatest challenge is presented by the last task on this short list. No one resource can be managed effectively in isolation. It will affect and be affected by management and use of other resources: salmon rivers flow from forest land and often have hydroelectric energy potential; large populations of wildfowl breed in intensively managed agricultural lands. Renewable resources offer Canadians much more than subsistence. They offer jobs, life-styles, wealth, recreation and spiritual refreshment. These all are important in a prosperous society, and they are all in demand.

Responsibility for management and conservation of resources is shared by the federal government, 10 provinces and two territories. Under the terms of the Canadian Constitution, responsibility for management of many natural resources, and hence for their conservation, is vested in the provinces. The federal government has had broad-ranging conservation responsibilities in the two territories, but is in the course of transferring many of these to the territorial governments. The federal

government regulates navigation, fisheries and pollution, manages migratory birds, national parks and other federal lands, conducts resource-related research, and attends to national issues and international affairs. Municipal governments make local decisions that affect resource management and they can become very active in conservation through autonomous agencies such as those governed by Ontario's Conservation Authorities Act.

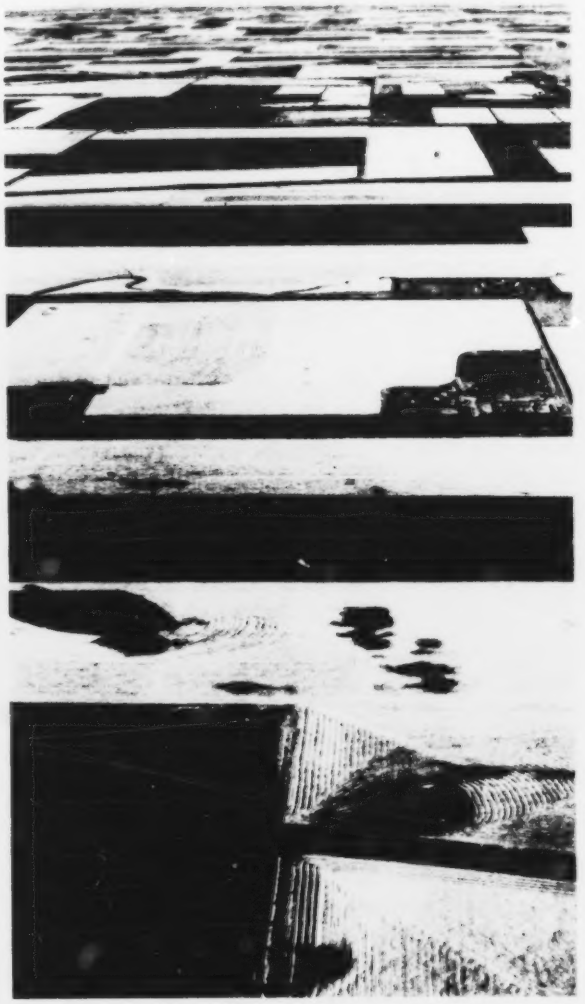
Although the complexity of Canada's political structure sometimes slows the development of national policies, such shortcomings are more than compensated by the quality that can be achieved by regionally oriented conservation programmes across the country. Furthermore, many Canadians, individually and through many non-government organizations (NGOs) and companies, have provided governments with advice, financial assistance and essential public encouragement for worthwhile conservation initiatives, and have achieved significant results of their own.

In addition to tending to domestic needs, however, Canadians must view themselves in the global context. We are called upon to protect life-support systems, particularly those of global significance. We must safeguard the Canadian portion of the world's genetic resources. We should also be aware of the effect our use of resources has on developing nations, and to cooperate as partners in their conservation and development programmes. This report illustrates how Canada is working towards the national and international conservation priorities set out in the World Conservation Strategy.

The World Conservation Strategy[1]

The World Conservation Strategy (WCS) represents a global consensus on the role of conservation in world development. Its purpose is to draw the attention of world leaders and decision makers to the increasingly dangerous stresses being placed on the biosphere, and to convince them that both life and sustained economic prosperity depend on the biosphere and on the wise use of its resources. The WCS was prepared by the International Union for Conservation of Nature and Natural Resources (IUCN), with the assistance of the World Wildlife Fund (WWF) and the United Nations Environment Programme (UNEP), which commissioned the initiative. It was reviewed and endorsed by the Food and Agriculture Organization of the United Nations (FAO), and the United Nations Educational, Scientific and Cultural Organization (Unesco).

Three objectives are central to the WCS, and form a framework for priority requirements which are to be considered by each nation:



An Aerial view showing the harvesting of wheat near Regina. S.S.C. Photo Centre A.S.C.

- **to maintain essential ecological processes and life-support systems,**
- **to preserve genetic diversity, and**
- **to ensure the sustainable utilization of species or ecosystems.**

Each of these objectives is discussed later in this report in the context of Canadian conservation issues.

The WCS provides a checklist of priority national and international actions, and calls upon all nations to adopt and implement conservation policies. These policies should provide a sound basis for national development. In doing so, nations will contribute to the global effort needed to protect the life-support systems of the planet,

[1] *World Conservation Strategy*, IUCN 1980.

and to improve the human environment. Recognizing this, the Government of Canada joined 33 other nations in proclaiming support for the WCS in 1980.

The Strategy in Canada

The WCS was discussed by provincial, territorial and federal governments at the 1981 annual meeting of the Canadian Council of Resource and Environment Ministers (CCREM). Following these discussions, the provincial and territorial governments approved in principle the objectives and concepts of the WCS, but voted to leave formal responses to the individual jurisdictions, that is, to the provincial, territorial and federal governments.

The Minister of the Environment endorsed the WCS on behalf of the federal government in October 1981. Now, five years later, this national report has been prepared by Environment Canada, compiled and condensed from information kindly supplied by many federal, provincial and territorial agencies across the country. **The report looks at achievements in Canada that are in keeping with the WCS**. Some of the reported achievements have been undertaken in direct response to the WCS, but many are events in a long and continuing history of policies and programmes concerned with conservation in Canada.

This report includes most kinds of conservation initiatives that governments have taken or supported, but space does not permit a comprehensive treatment. Rather, on the advice of contributors, the authors have selected highlights from different jurisdictions to illustrate the manner in which Canada addresses conservation issues. A list of federal, provincial and territorial contacts is appended to the report for those wishing to obtain more information on specific programmes. The report does not attempt to cover the many significant achievements of NGOs, industry and private citizens, although a few outstanding examples have been mentioned.

The report is organized to correspond with the WCS. It begins with Canadian responses to the priority requirements, described within the framework of the three WCS objectives. It continues with a review of the national priority actions and then with Canada's participation in priority international actions. The concluding chapter presents a synopsis of obstacles facing implemention of the WCS in Canada, and considers briefly how these obstacles might be overcome.

PRIORITY REQUIREMENTS

The First Objective of the WCS: Maintenance of Essential Ecological Processes and Life-support Systems

Essential ecological processes create and maintain conditions for life on earth, and sustain human endeavours to achieve economic and social development. They include the global processes affecting climate, and carbon, water and nutrient cycling; they include the production and maintenance of soils, clean air and clean water; and they include specialized biological processes such as pollination, predator-prey interactions, and seed dispersal. Essential ecological processes can thus be global, regional or quite localized in their impact.

Special mention must be made of Canada's extensive land mass and its influence on the atmospheric circulation of the northern hemisphere. In the process, a number of distinctive regional climates are formed which, in turn, influence the characteristics of natural communities across the country. The climate provides the heat, moisture and light needed by living things, but the strong seasonal contrasts of this high latitude land can make life precarious. Canada is very sensitive to climatic changes whether they emanate from natural causes or are brought about through human activity.

Life-support systems are those managed or unmanaged ecosystems, occurring naturally or resulting from human intervention, that sustain economic and social development. Forests support a large proportion of Canada's economy, and the livelihoods of almost a million people; they play a vital role in water conservation, and are important as wildlife habitats, as climatic regulators, and as the base of much recreation and associated tourism. The variety of Canada's agriculture is not always appreciated: in addition to grains, Canada produces significant quantities of vegetables, fruits and tobacco; peaches and wine grapes are grown in the Niagara Peninsula of Ontario and the Okanagan Valley of British Columbia.

A special section of this report is devoted to Canada's North, which comprises the Yukon and Northwest Territories. But it should be borne in mind that most provinces experience extreme conditions at their northern latitudes, and have to pay careful attention to the way these areas are developed and utilized. Canada's North contains one of the priority biogeographic provinces of the WCS, the tundra and barren arctic desert, and is the subject of a special section in this report.

Rivers, lakes, wetlands and marine waters support vital ecosystems. Nine of Canada's river basins are international, shared with the United States (US), as are the Great Lakes. The Great Lakes have also been identified as a priority biogeographical province by the WCS. Like the North, wetlands have been judged to be sufficiently significant and distinctive among Canada's life-support systems to warrant a special section. Canada's extensive coastline and continental shelf provide many habitats for globally significant marine wildlife and fisheries that support important regional economies and life-styles; some of these are shared with our neighbours, Greenland and the US, in particular.

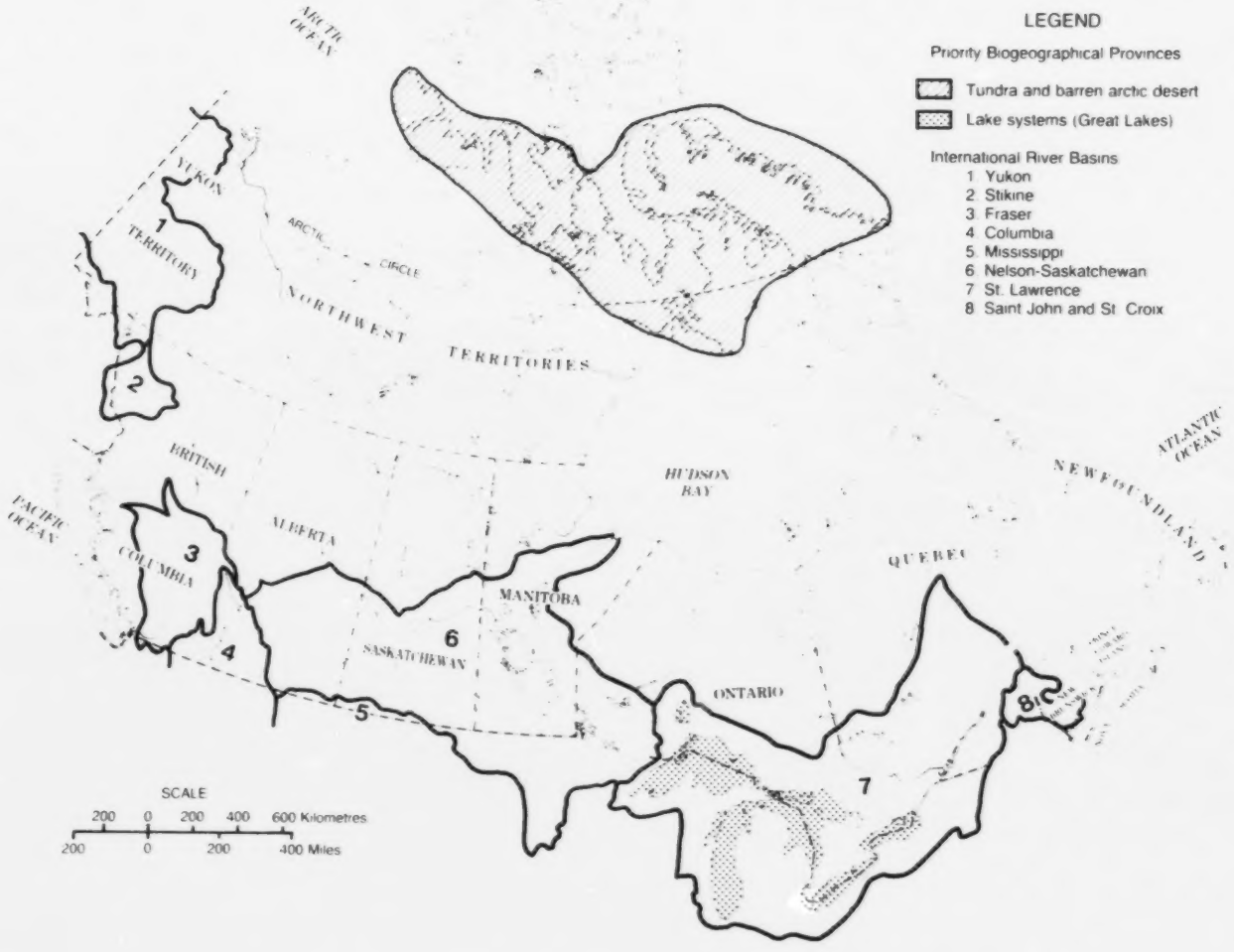
1a Reservation of prime quality cropland for crops

From the top of the world's highest free-standing structure, the CN Tower in Toronto, Ontario, on a clear day it is possible to see 37% of Canada's best (class I) agricultural land.

The proximity of good agricultural land to urban developments is no coincidence, but simply reflects the preferences of early settlers for good land. Today much prime farmland is under major urban centres and transportation routes, and urban requirements continue to remove the best land from farming. Ironically, the very people who demand farm products reduce the farmland's ability to meet these demands.

Nearly 1.2 million Canadians are employed in the agri-food sector. Agriculture has always been important in our balance of trade and, in 1983, cash receipts of Canadian farmers totalled $18.7 billion. All these benefits

PRIORITY BIOGEOGRAPHICAL PROVINCES AND INTERNATIONAL RIVER BASINS IN CANADA



Urban expansion onto prime fruitland in the Okanagan Valley, British Columbia.
Paul Rump, Environment Canada.

rest on 66 million hectares, or 7% of Canada's land base. In fact, the Canada Land Inventory (CLI), conducted between 1965 and 1975, showed that less than 5% of Canada is free from severe limitations for agriculture, and only 0.5% of the land can support a wide range of field crops. The inventory devised seven soil quality classes for agricultural production.

The conversion of prime farmland to urban uses is one of the principal concerns in resource management. In the first study of its kind, a nation-wide land use monitoring survey documented the rural land converted to urban uses in Canada's 70 urban-centred regions (over 25 000 population) between 1966 and 1981. Over the 15-year period, 57% (142 503 ha) of all rural land converted to urban uses was prime farmland. Although some of Canada's largest cities have consumed up to 20 000 ha of prime farmland in this period, smaller centres have also squandered significant areas of prime land.

Although conversion of rural land has accelerated in recent years, the proportion of prime land affected has diminished: from 1966-71, 62.9% of rural land converted was in CLI classes 1-3. This ratio declined slightly to 61% during 1971-76 and then declined strongly in 1976-81 to 50%. Such research indicates that policy and programme initiatives undertaken by the provinces, municipalities and the federal government are having some success in reducing the irreversible loss of Canada's productive farmland.

Losses to non-agricultural uses amount to an average of 10 000 ha of Canada's prime land every year. The losses, although small in absolute terms, are significant because they have occurred in some of Canada's most climatically favoured agricultural regions, such as southern Ontario, the St. Lawrence lowlands of Quebec and the fruit-growing regions of British Columbia.

Intense and continuing pressures from other land users continue to make inroads on the agricultural resource base. The combination of low commodity prices, high costs of farm inputs and reductions in both domestic and foreign markets translates into the sale of farmland for non-farm uses.

The irreversible loss of prime agricultural land is beyond the influence of technology, economic resources or management skills of the individual farmer. It is largely a result, intended or otherwise, of past and present government policies and programmes. However, the reservation of prime farmlands has become an issue of growing social, economic, environmental and political significance. Provincial governments are addressing the intensifying competition for, and loss of, prime agricultural land. The following examples illustrate how provinces have used comprehensive land preservation legislation, guidelines for foodland preservation, assessment and other land planning activities to safeguard agricultural land.

Under The Agricultural Land Commission Act, 1973, productive land in British Columbia is protected within Agricultural Land Reserves that in 1984 totalled 4.68 million ha; about half of this reserve is currently used for agriculture.

The Ontario government issued Foodland Guidelines in 1977 requiring municipalities to assign high priority to the protection of farmlands in preparing land use plans. Strengthened proposals have recently been published with the intention, after public review, of establishing the guidelines as a planning policy statement, to be adopted by the government pursuant to the province's Planning Act. In addition to proposing strengthened controls on development, generally in rural areas, the proposed policy statement includes more stringent policies for specific areas where specialty crops are grown.

The province of Quebec has instituted an Act to Preserve Agricultural Land to prevent the loss of good

arable land in that province. Under this act, the Government of Quebec, represented by the Commission de la protection du territoire agricole du Québec, identified arable lands and designated certain protected agricultural zones. The act prohibits in these zones all activity that is incompatible with agriculture and controls subdivision in order to preserve existing productive units and help maintain the viability of farming operations.

In Newfoundland, scarce agricultural land is protected from urban development by The Development Areas (Land Act) Regulations.

The rational use of limited cropland is one of the major challenges facing Canada today. Losses to non-agricultural uses are critical, and are aggravated by factors that lead to degradation of remaining farmland (see *1b* and *1c*).

1b Adoption of management practices to maintain the productivity of cropland, grazing land and forests, and

1c Prevention of soil degradation and restoration of land where soils are already degraded

Increasing concern has been expressed regarding the deterioration of Canada's soil resource and the implications of this for future generations. The effect of technological changes in cropping systems and the trend to intensive management of a narrow range of crops on each farm has come under scrutiny in recent years. Increased specialization and the decrease in integrated animal-crop farm units have reduced the land use flexibility for farmers. The resulting effect on the soil resource is increased erosion by water and wind, loss of organic matter, salinization, acidification and compaction.

The cumulative costs of soil degradation are significant. By one estimate, the soil erosion on prairie farms costs between $218 and $285 million annually and affects approximately 6.4 million ha. The costs are expected to increase by approximately $5 million each year. Salinization costs are estimated at between $100 and $300 million per year on approximately 2.2 million ha and are expected to increase by at least $1 million per year. Similarly in eastern Canada, soil degradation is lowering farm income. Erosion by wind and water is estimated to affect 1.2 million ha and cost farmers $100-200 million per year. Furthermore, compaction is estimated to reduce farm income by another $120 million per year on an estimated .91 million hectares.

Soil degradation has not caught the public's attention to the same degree as toxic pollutants in our lakes or acid rain. In 1980, a preliminary study by Agriculture Canada (CDA) identified soil degradation as a national problem. The issue was raised again in 1984 by the Standing Senate Committee on Agriculture, Fisheries and Forestry, which, after extensive public meetings and receipt of many briefs from concerned organizations, concluded that soil degradation was costing farmers more than $1000 million per year in lost farm income. They felt that "unless action was taken quickly, this country will lose a major portion of its agricultural capability". Technological advances such as improved crop varieties and increased use of fertilizers, which result in increased yields, have obscured the situation while doing little to conserve long-term soil productivity. The findings and recommendations of the Senate Committee were published in the report *Soil At Risk: Canada's Eroding Future*, which has done much to inform Canadians that soil degradation is a serious national concern.

Rill erosion in eastern Ontario, the result of spring runoff on soil intensively tilled the previous fall.
D.R. Coote, Agriculture Canada.

The role of the provinces in promoting sustainable agricultural practices is critical. All provinces are working to provide on-farm assistance for agricultural soil and water degradation problems, by providing technical

support staff and fact sheets. Expertise is supplied not only from the traditional agricultural ministries but from environmental and natural resource management agencies as well.

In British Columbia, problems of soil erosion, acidification, compaction and loss of organic matter are causing both a loss of agricultural production and environmental problems. The province has set aside $5.5 million, under a federal-provincial agreement, to address some of these problems.

Cooperative programmes in Alberta between the provincial and municipal governments provide site specific technical assistance to farmers with soil and water degradation problems. An Agriculture Cabinet Committee has recently been formed and the Environment Council of Alberta has completed province-wide hearings into maintaining and expanding the agricultural land base with an emphasis on soil conservation. Their final report including recommendations has recently been submitted to the provincial Cabinet.

The Province of Saskatchewan's research programme on soil degradation has produced a series of informative reports entitled "Save the Soil".

Ontario has a Soil Conservation and Environmental Protection Assistance Programme that provides financial incentives to farmers and technical advice about pollution control and soil erosion, which causes annual losses of $68 million in agricultural activity. Under the programme, soil conservation advisors are hired to work with farmers, and joint programmes with local conservation authorities are implemented.

In Quebec, le Conseil des productions végétales advises agricultural producers on methods of cultivation and soil management to ensure the long term preservation of the land resource.

New Brunswick provincial agricultural extension specialists are cooperating with farmers to implement soil conservation measures, especially on badly eroding potato fields.

Federal and provincial governments and universities carry out joint programmes which have application for on-farm conservation. These activities include research, data collection, preparation of soil survey maps and the assessment of agricultural land degradation using Canada-wide risk maps for wind and water erosion and acidity, salinity risk maps for the prairies, and compaction risk maps for the other provinces. Increased emphasis has been placed on soil and water conservation programmes in recent economic regional development agreements (ERDAs) signed between the two levels of government. Targeting of funds for soil and water conservation projects is an important component of current agreements between CDA and Manitoba, Saskatchewan, New Brunswick, and Prince Edward Island. Negotiations are under way with other provinces and it is expected that they too will contain such programmes. Under the Long Range Transport of Airborne Pollutants Programme, DOE in cooperation with the provinces is coordinating the preparation of mapped data on the sensitivity of non-agricultural land to acid deposition.

The federal Interdepartmental Committee on Land is a mechanism for developing guidelines, practical solutions and means to ensure that attention in federal policies and programmes is given to soil degradation.

CDA has designed a strategy to promote sustained use of soil and water. Its four principles are (i) the need to implement farming methods that prevent soil and water degradation, rather than treating the symptoms; (ii) the need for concern about soil degradation to be reflected not only in conservation programmes but also in commodity development strategies and related policies; (iii) the need for conservation programmes to focus on areas where soil degradation currently poses the greatest threat to agricultural productivity (the lower Fraser River Valley, the Peace River district, central and south Alberta, Saskatchewan, southern Ontario, the St. Lawrence lowlands of Quebec and the Maritime potato growing area); and (iv) the need for improved flow of information to farmers and better communication generally.

CDA researches and evaluates different tillage methods for optimal snow/moisture management, erosion protection and improved soil structure, and has programmes to provide a better understanding of the processes of soil degradation and to develop remedial measures. There has also been increased emphasis on soil and water conservation projects by the Prairie Farm Rehabilitation Administration (PFRA). This group was mandated under a federal act of parliament in response to the 'Dust Bowl' of the 1930s and at the request of the prairie provinces for assistance in combatting the severe drought and wind erosion problems of that period. It assembled badly eroded land into community pastures to protect these submarginal croplands from severe wind erosion. These pastures, in conjunction with PRFA's water supply programme, assisted in conservation planning and beef production.

Recent achievements include publications detailing the physical and economic extent of soil degradation on agricultural lands and the initiation of soil conservation technology transfer programmes in cooperation with the provinces. The problem of soil degradation was included on the agenda of the First Minister's Conference held in 1985, as recommended in the "Soil at Risk" report.

A Task Force was created to investigate, among other topics, the current state of soil and water conservation legislation, programmes and activities in Canada. The report, expected in the fall of 1986, should help to provide direction to the conservation movement. It will include input from a National Conference on Soil Conservation Strategies in Canada, held in April 1986 in Saskatoon, Saskatchewan.

Finally, there has been increased emphasis on soil and water conservation by agri-business and farmers' organizations. The National Action Committee on Soil Conservation, under the auspices of the Canadian Federation of Agriculture, is also monitoring and evaluating the performance of the various programmes, activities and agencies involved in soil conservation, and works in close cooperation with them to ensure that research and delivery programmes are compatible with regional requirements.

Id Protection of watersheds, especially upper catchment areas

Canada is often portrayed as a land of sparkling lakes and rivers with an endless supply of good quality water of which its people are proud. But, although we do have 9% of the world's fresh water (as measured by total river flow), two thirds of it flows north away from 80% of our population. The demands of industry, agriculture and communities are approaching the limits of natural supplies in some regions. We have tampered with the water cycle in its most easily accessible part – the fresh water in rivers, lakes and underground aquifers – and the consequences have not always been good. We have overburdened the diluting capacity of the Great Lakes, harming fish, wildlife, recreation and drinking water. We have dammed rivers to produce hydroelectric power, altering the landscape and frequently disrupting fish and wildlife habitats and local economies.

Responsibilities for fresh water are shared among the federal and provincial governments. There have been many achievements in protecting Canadian watersheds. In some instances the action has come after a crisis, as in the Great Lakes clean-up (discussed later) or the measures taken to reverse negative environmental impacts of the Bennett Dam. But in many cases, success has been the result of careful study and management of the watershed that took into account climatic, geological, ecological and socio-economic factors. Since 1969, in the water-short prairies, the Prairie Provinces Water Board has been ensuring the equitable apportionment of water from rivers flowing across three provinces. The board has recently completed a study for developing water demand analysis models. In anticipation of energy development in the 1787 000 km^2 Mackenzie River Basin in northern Canada, a study looked at the watershed as a whole. It examined the importance and interdependencies of the water resources and the development implications for these resources. An agreement to manage the basin equitably and in an environmentally sound manner is being negotiated among British Columbia, Alberta, Saskatchewan and the territorial and federal governments, each of which have jurisdiction in the basin. The Fraser River Estuary Study in the Greater Vancouver area of British Columbia sought to develop a management programme to preserve and protect the estuary as a vital natural and economic resource. Over 30 such federal-provincial studies or programmes have been undertaken on major watersheds.

There are about 20 watershed management studies and programmes in progress in Canada. A new study in Saskatchewan, will examine water supply and demand in the South Saskatchewan River Basin, the primary source of high-quality water for the dry prairie region, and will develop alternative watershed management strategies so as to promote sustainable use in the area. In Prince Edward Island, a study of groundwater supplies, upon which much of the province's economic development depends, is under consideration. Recently, New Brunswick has prepared a draft watershed protection programme.

There are about 100 pieces of legislation in Canada that have been used to protect watersheds. Federally, the Canada Water Act deals with water management primarily through federal-provincial cooperation; the Fisheries Act can be used to protect water quantity and quality as it applies to protection of fish habitats and is the basis for the proposed Fish Habitat Management Policy; the Environmental Contaminants Act applies to toxic and dangerous substances; the Prairie Farm Rehabilitation Act provides for development of water supplies and promotes land use practices to rehabilitate areas of drought and drifting soil in the prairies; the Navigable Waters Protection Act controls building in navigable waters and prohibits dumping wastes where they might interfere with navigation.

The provinces, with primary jurisdiction over waters within their boundaries, protect watersheds through their own legislation, regulations and programmes. For example, Ontario's water quality and supply and sewage disposal are regulated through the Water Resources Act, 1956. The Ontario Conservation Authorities Act, 1946, enables municipalities to manage water resources cooperatively. Ontario has also entered into agreements with the federal government over management of Great Lakes water quality and of the regionally important Rideau-Trent-Severn river systems.

Integrated resource planning and management has been embodied in Alberta's Eastern Slopes Policy, which tries to optimize use of public land and resources on the

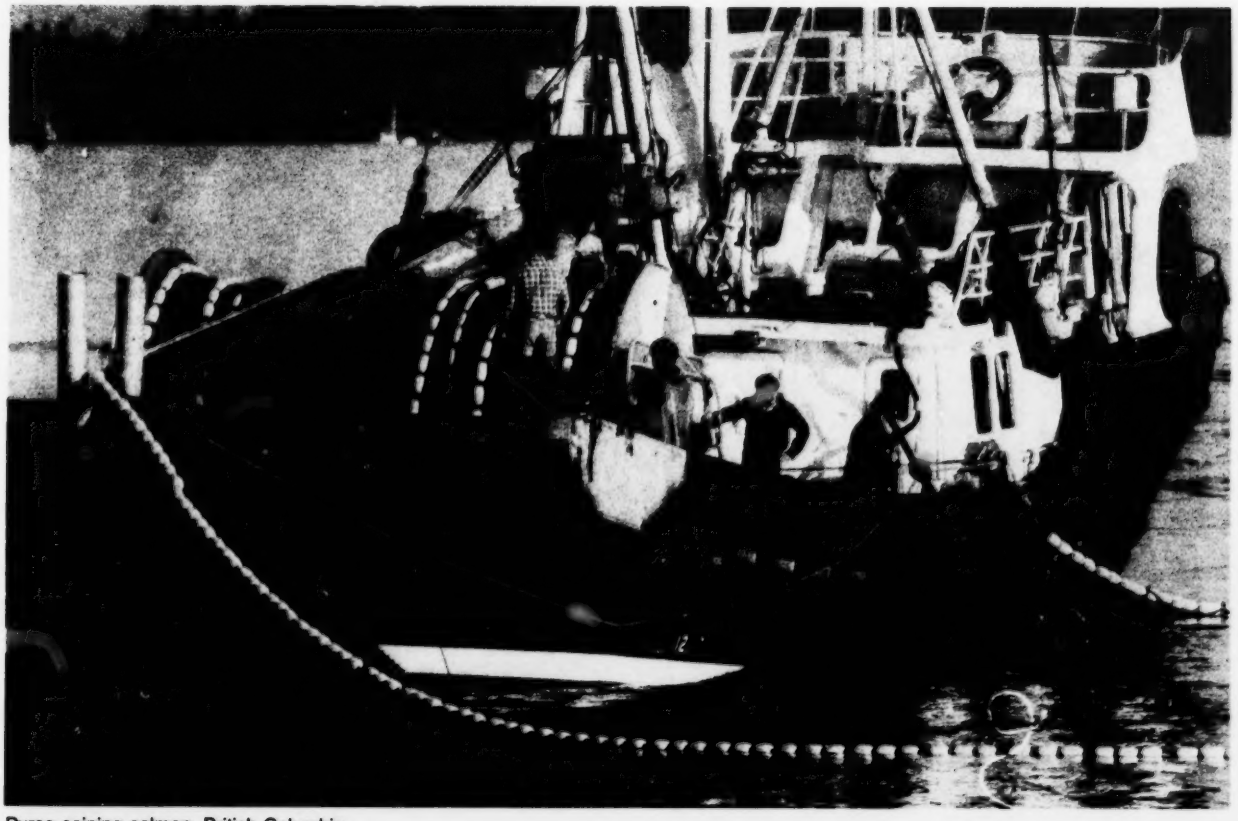
Lake Superior, the largest of the Great Lakes Priority Biogeographical Province.
Canadian Forestry Service.

eastern slopes of the Rockies. It promotes cooperation among 10 provincial resource management agencies (responsible for 25 pieces of legislation). The policy calls for wide public consultation, and was itself the result of extensive public hearings and consultation carried out by the Environment Council of Alberta. Alberta has stressed the role of wilderness parks and other protected areas in preserving watersheds. The government of British Columbia has developed an integrated policy to protect community watersheds, and has collaborated with the Department of Fisheries and Oceans (DFO) and industry to develop logging guidelines for the sensitive watersheds of coastal and interior British Columbia. In New Brunswick, the Crown Lands and Forest Act is a major piece of legislation affecting watershed planning in 44% of the province's land area.

Environment Canada (DOE), the lead federal agency in water issues, has had a stated policy to promote conservation and sustainable use of water, restoration and protection of water quality, and comprehensive watershed planning for multi-purpose water use. In January 1984, the Minister of Environment initiated an Inquiry on Federal Water Policy, with the objective of developing a policy that would ensure Canadians sufficient, safe water to sustain their physical, economic and social well-being for all time. The inquiry's report makes 55 recommendations that strongly support the principle that water is a life-support system which must be managed wisely to promote sustainable development. Two of the key principles which provided the framework for the Strategy are that the watershed is the natural and most appropriate unit for water management, and that water management should accommodate the interdependence of multiple water and land uses within the watershed.

1e Maintenance of the support systems of fisheries

Canadians derive great benefit from their abundant marine and inland fisheries. The combined value of commercial and recreational fisheries is estimated to be $3000 million annually. Some 70 000 people have been employed in the primary industry. Each year, over three million Canadians and Americans are attracted to Canada's world-renowned sports fisheries, creating significant opportunities in service and secondary manufacturing industries.



Purse seining salmon, British Columbia.
Department of Fisheries and Oceans.

Saltwater fisheries often depend on extensive oceanic ecosystems that are difficult to protect other than through international conventions and agreements; these are examined in *3h* and *3n*. However, localized ecosystems are crucial to many fisheries. In Canada, the need for protection of estuaries, shallows and other important coastal features has been addressed through different programmes, such as the Fraser River Estuary Management Plan, and various coastal conservation programmes. For anadromous species, notably salmon, the maintenance of freshwater habitat is critical for reproduction, and is a focus of DFO's proposed Fish Habitat Management Policy. The underlying principle of this policy is to ensure that no net loss occurs in the productive capacity of fisheries. The policy recognizes the often extensive nature of ecological systems supporting fish habitat, the existence of other uses of these systems, and the need for integrated resource management. The policy will form the basis of a comprehensive approach to the maintenance of many coastal and inland fisheries in Canada.

Freshwater fisheries are generally more amenable to protection and management than are saltwater fisheries, and their value for recreation has favoured their maintenance in every province and territory. In British Columbia, recreational freshwater fisheries generate $390 million annually, compared to $350 million from the commercial salmon fishery, about $190 million from other commercial saltwater fisheries combined, and $200 million for recreational saltwater fisheries. The value of commercial landings in Ontario approximate $35 million annually. Sport fishing contributes $700 million annually to the economy and provides 25 000 full-time jobs. The community Fisheries Involvement Programme encourages members of the public to undertake their own fisheries management projects, with advice and financial assistance provided by the government. Projects involve the rehabilitation of fisheries and fish stocking. The programme enhances fisheries and promotes a greater sense of public responsibility in the stewardship of resources.

A special programme of research, management and lamprey control in the Great Lakes was effected through the Convention on Great Lakes Fisheries in 1955, and has contributed to improvements of productivity throughout the Great Lakes system.

Effective fishing regulations and control, stock assessments and international agreements are essential supporting actions and are reviewed elsewhere in this report (*2k*, *3h*, *3n*). The federal, provincial and territorial governments each exercise strong yet flexible regulations aimed at sustainable use of fisheries under their respective responsibilities. In addition, information on weather and ice is essential for the reduction of economic risks and hazards to life in the commercial fisheries of Canada's coastal and offshore waters. Services that include storm, wave height and ice reports are provided daily by DOE.

1f Control of pollution

In common with other industrialized societies Canada must contend with pollution of its air, water, soil and biota. Toxic chemicals in the Great Lakes, the groundwater, the high Arctic and mothers' milk are warning signals of a very real problem facing us as we learn to deal with both the benefits and risks of living with chemicals.

Pollution control is effected primarily through federal, provincial and territorial legislation. Some of the principal federal acts are as follows.

The Transportation of Dangerous Goods Act (1980) promotes public safety in the transportation of such goods, and is administered by Transport Canada (DOT). The Transportation of Dangerous Goods Regulations (1985) incorporate existing regulations and improve and expand on them, so that the requirements for handling and transporting dangerous goods are uniform across Canada and cover all modes of transport. DOE is responsible for applying those regulations that are specific to hazardous wastes entering or leaving Canada, and for advising DOT on environmental implications of the administration of the regulations.

The Ocean Dumping Control Act (1975) serves two main purposes: to fulfill Canada's obligations under the London Dumping Convention, and to protect Canadian marine environmental quality, chiefly from toxic wastes. The disposal of wastes in Canadian waters and by Canadian vessels anywhere on the ocean is regulated through a system of permits and inspections administered by DOE. Emerging issues that will be dealt with through the London Dumping Convention are incineration at sea and the disposal of low-level radioactive wastes. Solid waste disposal and incineration at sea are of domestic concern to Canada.

Pest Control Products Act (1969 revision) is administered by Agriculture Canada (CDA) with advice from DOE. The act regulates the manufacture, storage, distribution and use of pest control products (pesticides) in Canada.

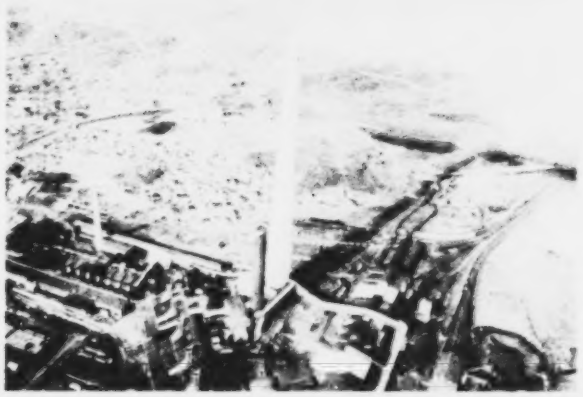
The Clean Air Act (1971-amended 1980) provides primary legislative authority for regulation of industrial sources of certain emissions to the atmosphere, and fuel composition. Regulations are in place for emissions of vinyl chloride, asbestos, lead from secondary lead smelters, and mercury from chloralkali plants, and for the lead and phosphorous content of fuels. The Clean Air Act also authorizes the operation of the National Air Pollution Surveillance network across Canada for the year-round monitoring of pollutants such as sulphur dioxide, nitrogen oxides, ozone, carbon monoxide and particulates. Under a 1980 amendment to the act, DOE is empowered to take steps to control emissions that affect another country. This applies only to countries providing reciprocal protection. The act is administered by DOE.

The Fisheries Act (1977 amendment) protects fish and fish habitat and regulates use of fish. Section 33 of the act provides for the abatement and prevention of pollution (i.e., substances deleterious to fish). The Fisheries Act and its pollution control provisions serve essentially to conserve and protect fisheries resources and habitats. DFO administers the act except for provisions of section 33, which are administered by DOE.

The Motor Vehicle Safety Act (1971) is administered by DOT. DOE provides advice to DOT on aspects dealing with emissions from motor vehicles. Standards exist for hydrocarbons, carbon monoxide and nitrogen oxides emissions from all vehicles, and for particulate emissions from heavy-duty vehicles. New emission standards for light-duty vehicles will come into effect for the 1988 model year. These more stringent requirements also cover diesel particulate emissions. Heavy-duty vehicle emissions are expected to be further regulated in the future.

The Environmental Contaminants Act (1976-amended 1984) protects human health and the environment from commercial chemicals that find their way into the environment. Use, sale, manufacture and importation are addressed. The program has two components, one focused on existing chemicals, the other on new chemicals. The Environmental Contaminants Act is designed as a backup to other federal and provincial laws. It is administered jointly by DOE and Health and Welfare Canada (HWC). A proposed new Environmental Contaminants Act will require that all new chemicals be subject to a review process prior to being manufactured or imported into Canada.

The provinces generally have legislation to cover most aspects of environmental protection. Manitoba has established a citizens' Environmental Council that advises the government on disposal of hazardous chemicals; a special Hazardous Waste Programme has been devised



Development of mineral resources has meant both prosperity and pollution for Canadians.
Canadian Forestry Service.

and public hearings held on design and siting of new facilities. Manitoba's Clean Environment Commission regulates emissions of contaminants to air, soil and water. A Pesticides Act (1973) provides comprehensive regulation of pesticides in Ontario; the province's Environmental Protection Act, established in 1971, forbids the discharge of any contaminant into the natural environment in amounts or concentrations exceeding those prescribed by regulation. New Brunswick implemented a Pesticides Control Act in 1979. Newfoundland established Storage and Handling of Gasoline and Associated Products Regulations in 1982. Ontario's Dangerous Goods Transportation Act 1981 imposes responsibilities on all agencies producing, transporting and receiving such materials.

In addition to legislation, the provinces have implemented a wide range of environmental protection programmes. In Quebec, activities which cause pollution are regulated under la Loi sur la qualité de l'environnement. The province has identified three priority areas for environmental protection: water pollution, hazardous substances and acid precipitation. Under water pollution control, major efforts are directed at controlling municipal waste discharge and the problem of non-point source pollution from animal wastes in agricultural operations. Quebec has identified 314 contaminated dump sites potentially dangerous to public health and the environment, and is studying the nature of these sites and possible decontamination procedures. In 1985, the Quebec government passed legislation which will see Quebec meet emission targets as spelled out in the 1985 federal-provincial agreement. New Brunswick's Clean Environment Act provides umbrella legislation for a variety of environmental management and protection concerns.

The net result of federal and provincial policies and programmes has been encouraging. Canada has recently upgraded its goal for eliminating lead from gasoline. A federal-provincial plan of action to eliminate PCBs from the Canadian environment is being carried out; much-needed destruction facilities will be established and uniform national standards for PCB transportation and destruction will be set. The National Incinerator Testing and Evaluation Programme seeks to identify the best design and operating conditions for municipal incinerators from the viewpoint of harmful air emissions. In the proposed cleanup of the Sydney Tar Pond in Sydney, Nova Scotia, an 80 year deposit of tar from coke oven operations will be removed and incinerated over a 10-year period at an estimated cost of $41 million, 80% of which will be recovered as useable energy.

Some measure of the complexity of operating national pollution control programmes is to be found in the variety of the institutional mechanisms used to achieve the necessary inter-agency cooperation. A proposed new chemicals programme will follow the principles developed by the chemicals group of the Organization for Economic Cooperation and Development (OECD). The national hazardous waste program, including the PCB action plan, is developed through the Canadian Council of Resource and Environment Ministers. Air programmes are monitored and developed by the Federal Provincial Advisory Committee on Air Quality and its subcommittees and working groups. The national toxic chemicals programme is administered through the Interdepartmental Committee on Toxic Chemicals.

The Second Objective of the WCS: Preservation of Genetic Diversity

Although the WCS is clearly aimed at improving and maintaining the biosphere for human benefits, the priority assigned to the preservation of endangered species, irrespective of their current use, establishes an ethical context that reaches beyond the basic needs of humankind.

Nevertheless, we cannot ignore the fact that preservation of genetic variation, both among and within species, has vital practical ends. Our agricultural, forest and fishery industries all rely on crops or stocks that are adapted to local or regional conditions, and that can withstand the persistent onslaught of pests, diseases, predators and pollutants. Furthermore, these factors themselves change, presenting a never-ending challenge to our resource base. The prospect of changing climate puts even greater emphasis on the need to explore, assess and safeguard varieties. Nor can we afford to restrict our efforts to crops of current value. New technologies may enable us to combine and use genetic resources in non-traditional ways. But none of these things will be possible if we do not have the genetic resources to draw upon. The WCS calls for compre-

hensive programmes to protect genetic diversity, including the establishment of areas where entire representative communities can be protected *in situ*.

Ig Prevention of species extinctions

Canadian lands and waters, with their diverse climates, soils and terrain, support a relatively small number of indigenous animal and plant species, including some 192 terrestrial and marine mammals, 518 birds, 82 reptiles and amphibians, close to 1000 fish species (including 190 freshwater), about 100 000 invertebrates, and some 3300 vascular and non-vascular plants. We know about the extinction of seven Canadian species in the last 200 years, (two mammals, three birds and two fish), and the extirpation from Canada of two mammals (black-footed ferret and swift fox).

In 1986, 11 mammals, 11 birds, 1 reptile, 3 fish and 19 plants are designated as endangered or threatened in Canada, and the status of 60 more species is under study. Some of these species are well represented by populations in other countries, but are at the edge of their range in Canada. These Canadian populations are important because their adaptive potentials are being tested at an evolutionary frontier. For other species, especially in the arctic and nearctic realms, Canada is the custodian of a large part or all of the global population. The possible loss of these species is important in itself, and also for what it indicates about the health of the ecosystems that support them.

Endangered species laws and programmes vary across the country. Two provinces, Ontario and New Brunswick, have Endangered Species Acts aimed at protection of any vulnerable fauna or flora. Other jurisdictions – provincial, territorial, and federal – have wildlife legislation and policies which expressly provide for protection of at least some species, although flora and invertebrate fauna are often overlooked.

The Federal-Provincial Wildlife Conference provides a forum for the inter-agency coordination required in endangered species programmes in Canada. Its Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has members from all provinces, territories, federal agencies with mandate or expertise, and three national conservation organizations. COSEWIC has so far considered and assigned national status to 115 species, races and populations of prime concern. The work by COSEWIC at the national level is complemented by determinations of species status at provincial and territorial levels.

The most significant Canadian achievements in preventing species losses, in terms of the number of species involved and breadth of their distribution, are in habitat protection (see *Ii*). Recent initiatives that reflect

Peregrine Falcons are being bred using artificial insemination. Canadian Wildlife Service, Environment Canada.

a new cooperative approach among non-government organizations (NGOs), provinces and federal agencies include three programmes spearheaded by the World Wildlife Fund Canada – "Whales Beneath the Ice", "Carolinian Canada", and "Wild West", the latter two dealing with protection of endangered communities of species rather than single species. In another multi-agency initiative, involving the Province of Quebec and DFO, a management plan for beluga whales in the St. Lawrence River, with designated sanctuaries, is under consideration.

Canada now has captive breeding and rearing programmes underway to rehabilitate four very different species, and plans for a fifth are being developed:

a) **Peregrine falcon rehabilitation.** Several raptor breeding and rearing facilities have been developed to save the endangered Eastern Peregrine. A number of young birds have been released in Montreal, Ottawa, Toronto, Algonquin Park in Ontario, Edmonton and northern Alberta.

b) **Wood bison recovery.** In 1965, 23 wood bison found in Wood Buffalo National Park were transferred to Elk Island National Park to form the protected gene pool nucleus, or base herd. Progeny from this herd have been transferred to six Canadian zoos and two zoos outside Canada; successful

Captive-bred swift fox ready for release into the wild.
Canadian Wildlife Service, Environment Canada.

transplants have been completed in the Northwest Territories (NWT) and others are in progress.

c) **Swift fox rehabilitation.** Progeny from the initial breeding stock have been released in Saskatchewan and Alberta.

d) **Whooping Crane recovery.** The only existing population of the endangered Whooping Crane nests fairly securely in Wood Buffalo National Park, but makes a long migration to Aransas, Texas to overwinter. A number of eggs are taken annually from their nests in the NWT and transferred to Gray's Lake, Idaho, where they are fostered by Sandhill Cranes. The aim is to establish a second population of Whooping Cranes which will breed in Idaho and winter in New Mexico.

e) A programme to rehabilitate the **Piping Plover**, a small shorebird recently declared endangered, will begin in 1986.

Canadian zoos and aquaria provide essential facilities for captive breeding and rearing programs for Canadian species, in locations that give excellent opportunity for public education. A large number of NGOs include species preservation among their objectives. In Quebec alone, there are more than twelve such agencies. NGOs, including the World Wildlife Fund Canada, the Canadian Nature Federation and the Canadian Wildlife Federation, are prominent in providing public information and education kits for schools.

Canada's international involvement in protecting endangered wild species is described in *3b*. Additional contributions to species protection abroad will increasingly require requests from the host countries.

The Canadian effort in preventing species extinctions is hampered by (i) the lack of a national strategy; (ii) failure to include all animals and plants in the scope of endangered species legislation; and (iii) inadequate funding and public commitment to accelerate threatened species programmes enough to counteract the current rate of loss of threatened habitats.

1h Preservation of as many varieties as possible of domesticated and other economic or useful plants, animals and microorganisms and their wild relatives

Diversity is the basis of breeding. It is essential to preserve the largest possible spectrum of genetic diversity because the future orientations of breeding are impossible to predict. This requirement is examined from the three perspectives of agriculture, forestry and fisheries.

Agriculture

The Expert Committee on Plant Gene Resources (ECPGR) provides a focus for Canadian activities in plant genetic resources. The ECPGR reports to the Canada Committee on Crop Production Services and to the Canadian Agricultural Services Coordinating Committee of CDA. The ECPGR also advises Plant Gene Resources of Canada (PGRC).

PGRC is involved with an international network of institutions having similar aims and pays particular attention to crop plants of economic importance in Canada. Germ-plasm for off-site collections is obtained from domestic and foreign sources. Canadian breeders and scientists donate germ-plasm that they feel has genetic quality or uniqueness. The PGRC central office also initiates requests for germ-plasm from Canadian sources. Canadian scientists have collected native germplasm, particularly small fruits (e.g., blueberries, strawberries) and wild relatives of cereal crops. They have also brought germ-plasm into the country as a result of government-supported collecting missions abroad, especially landraces and wild ecotypes of oats and barley.

The PGRC central office conducts an ongoing and extensive programme of germ-plasm exchange with foreign scientists and genebanks. In 1985, for example, more than 2200 seed samples were received from 18 different countries. On the average, the number of genetic stocks preserved by PGRC has grown by ap-

proximately 3000 per year. The central office of PGRC is responsible for the preservation of some 80 500 seed stocks. More than 80 countries of origin and 550 species and subspecies are represented in these collections. It has also accepted responsibility from the International Board for Plant Genetic Resources for managing world principal base collections of oats, barley, and duplicate seed samples. Crop data banks exist for the national base collection only. Canadian Genetic Resources Inventories have been published for alfalfa (1976), oats (1982), tomato (1984), barley (1985) and wheat (1985).

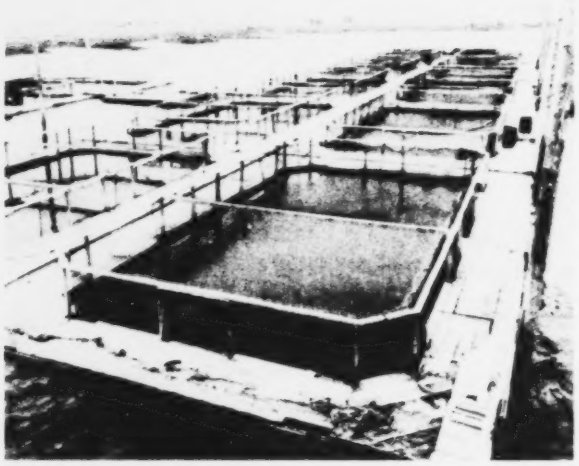
Forestry

Forestry in Canada is based largely on a wealth of native tree species. There are at least 10 softwood species of major commercial importance, numerous valuable hardwood species, and many unused species among a tree flora totalling 148 species. Much has been done to preserve the genetic diversity of the immensely valuable commercial forest species, including research into patterns of genetic variation, establishment of registration procedures and zones to ensure that the correct seeds are used in regeneration, and identification, testing and preservation of superior stands and parent trees *in situ*, or *ex situ* in seed orchards and seed banks. By 1981, 129 seed orchards totalling 364 ha had been established in Canada. The National Tree Seed Centre of the Canadian Forestry Service contains over 2000 seed acquisitions of 200 native and exotic species, with an additional 600 seedlots of native *Alnus* species collected as a contribution to the International Energy Programme Forest Biomass project.

The provinces are active in conservation of genetic resources, and maintain large stores of seed that buffer the erratic seed crops common to many species. Collaboration in the use of genetic resources has been facilitated through the Canadian Tree Improvement Association. Regional needs are addressed through cooperative tree improvement councils supported by provincial governments. For example, the Coastal Tree Improvement Council of British Columbia has proposed methods for identifying and managing genetic resource populations *in situ*. In Alberta, a systematic survey of forest stands is to be undertaken to identify sites for developing seed stands and gene conservation areas.

Fisheries

Commercial and recreational fisheries are based on a wide variety of species found off the Atlantic and Pacific coasts and in the extensive inland systems of lakes and rivers. The aquaculture industry is poised for development, and includes culture of nine genera of finfish, seven of shellfish, two of crustaceans and three of marine plants. Preservation of genetic diversity of stocks



Fundy Aquaculture Ltd., Grand Manan, New Brunswick.
M. Thérien, Department of Fisheries and Oceans.

on which these activities depend is fast becoming an imperative.

The federal Fisheries Act provides umbrella legislation for conservation and protection of fisheries resources in Canada. Provincial regulations control the introduction of non-indigenous species. The Fish Health Protection Regulations, designed to prevent the introduction and dissemination of infectious diseases, protect commercially important salmonid species. Relevant genetics research conducted in government, university and private sector laboratories is generating data on which to base programmes for the strategic use of genetic material.

Canada requires a registry to record performance characteristics and related facts for selected stocks, particularly for aquaculture; sets of standards for commerce in germ-plasm and for biotechnology that might have consequences for genetic diversity; and protocols to preserve the genetic integrity of selected wild stocks and rare species.

1i Establishment of a comprehensive network of protected areas, securing the habitats of threatened, unique and other important species, unique ecosystems, and representative samples of ecosystem types

The most effective way to safeguard threatened species is to protect their habitat and the ecosystems of which they are a part. This protection must be supported by appropriate legislation. Canada's recent

progress in this field is remarkable, although the task of achieving a fully representative network of protected areas is far from complete.

Protected areas perform a variety of functions. The focus here is on sites that are relatively unaltered samples of natural areas that are essential for genetic conservation, research and educational purposes. The areas serve as yardsticks for measuring humanly-induced damage or change, and should collectively reflect the ecological diversity of Canada.

Efforts to protect natural areas systematically began with the International Biological Programme (IBP) during 1964-74, when a total of 964 IBP sites were identified across 10 regions of Canada. Being on the checklist conferred no protection on a site, but effectively drew scientific, public and political attention to its importance. In 1971 British Columbia took a pioneering step with the enactment of an Ecological Reserves Act, and by 1972 had established 54 reserves under this legislation. Other provinces followed: eight provinces now have legislation specifically addressing ecological reserves. All have other statutes that are or may be used as support, as illustrated by the Recreation Development Act, 1974 and the Planning Act, 1969, in the Province of Prince Edward Island.

By 1985, a total of 565 protected sites had been officially declared among the provinces and territories, under various designations that include ecological reserves, natural areas, wilderness parks, nature reserve zones and other parts of provincial and national parks, and bird sanctuaries. A further 359 candidate sites had been identified by the same year.

Provincial parks achieve many of the objectives of ecological reserves. For example, British Columbia maintains 367 provincial parks with a total area of 4.6 million ha, 85% of which conserve natural resources within an unmanaged wilderness setting. Alberta has developed a new policy that classifies protected areas into four legislated classes: ecological reserves, wilderness areas, provincial parks and recreation areas, and further subdivision is in progress. The province views a network of protected areas as being one of two mutually supporting conservation measures, the other being the practice of integrated resource use. In the territories, protected areas are provided for within the terms of land claims legislation.

The federal government has numerous legislative instruments with which to protect sites, species and ecosystems, although none is designed for protection of ecological reserves as such. Much has been achieved through the *de facto* reserves of national parks. Thirty-one national parks occupying 140 844.7 km^2 have been established since 1885 (four of these have yet to be proclaimed under the National Parks Act); 10 more are proposed. As a basis for conservation, the scheme is being augmented significantly through new concepts for national marine parks, Canadian landmarks, Canadian heritage rivers and trails, and cooperative heritage areas. The national parks system is developed according to a National Parks System Planning Manual in which 39 terrestrial and 29 marine regions are defined. About half of this territorial biophysical framework is represented at present.

A variant of the prairie crocus, one of Western Canada's wildflowers. Donna Stewart.

Several other federal programmes and responsibilities relate to ecological reserves. The most important are based on the Migratory Birds Convention Act and on the Canada Wildlife Act, under which DOE can acquire lands as national wildlife areas, or, jointly with provinces or territories, as cooperative wildlife areas. Over 40 such areas have been established. The Canada Committee on Ecological Land Classification has developed a framework for ecological inventory that holds considerable promise as a basis for reserve planning.

Many non-government organizations (NGOs) help to swell the national effort to protect ecological reserves, either through their own programmes of acquisition, or through fund raising, advice and other assistance.

Notable among these are the Nature Conservancy of Canada, Canadian Wildlife Federation, Canadian Nature Federation, Canadian Institute of Forestry, Canadian Botanical Association, Canadian Arctic Resources Committee, and the National and Provincial Parks Association. Significant contributions have been made at regional levels, by, for example, the Association of British Columbia Professional Foresters, the Saskatchewan Wildlife Federation Habitat Trust and the Saskatchewan Natural History Society. Cooperative programmes between NGOs and provincial governments have been particularly effective. The Canadian Council on Ecological Areas provides an independent national forum that encourages the selection, protection and stewardship of a comprehensive system of ecological reserves. Membership includes representatives of government departments, NGOs, universities and the public.

The Third Objective of the WCS: Sustainable Utilization of Species and Ecosystems

This objective means, very simply, managing the use of living resources so that they last indefinitely. Canada's living resources are derived from both managed and unmanaged ecosystems and thus comprise both domesticated and wild species. The distinction is becoming less clear as, for example, aquaculture expands into commercial fisheries, as forests are regenerated with genetically improved stock and become more intensively managed, and as ranching is extended to native species. Nevertheless, native species of trees, fish, and furbearing animals will retain great significance in resource industries for the foreseeable future. Furthermore, natural ecosystems and wild animals and plants are irreplaceable as sources of recreation and pleasure for Canadians and their valued visitors.

Despite a long history and an extensive network of resource management agencies, questions concerning the sustainability of certain ecosystems in particular remain, and constitute some of the major issues referred to earlier. The immediate and often urgent needs of farmers and the forest industry, for example, are sometimes incompatible with the sustainability of the soil or forest resource on which they depend. The WCS calls particular attention to the global importance of fish and other aquatic animals as sources of protein. Although Canada is not a major consumer, it is a major exporter of seafoods, and shares responsibilities for sustaining fisheries with several countries. The global importance of fisheries is evident from the number of conservation actions recommended in the WCS.

1j Regulation of living resource utilization so that it is sustainable

The diversity of living resources, coupled with the allocation of many responsibilities for their management to the provinces and territories, has led to a multitude of regulatory instruments across Canada. The result has been the development of a national framework of strategies that promote sustainable utilization of specific regional resources. Across the country, utilization of each resource is regulated by provincial and territorial legislation. The federal government also regulates resource utilization, particularly for fisheries, migratory birds, and where issues cross jurisdictional and international boundaries. A goal of all provincial, territorial and federal governments is to regulate the use of living resources so that they are sustainable, because this is clearly in the long term interests of all Canadians. Information on specific resource regulation may be obtained through government contacts listed at the end of this report. Section *3b* describes international resource utilization agreements.

The concept of sustainable utilization of wildlife is especially important to native peoples, many of whom depend on fish and other wildlife for nutritional and economic needs, particularly in northern Canada. Treaties and subsequent legislation have recognized special native rights and access to fish and other wild animal resources. The Constitution of Canada also recognizes existing aboriginal and treaty rights. The scope and extent of these rights are in the process of definition in the current negotiation of native land claim agreements. It is expected that these rights will be safeguarded, and native users involved further in managing these resources, so as to contribute to sustainability of utilization.

1k Reduction of incidental take

There are ecological, ethical and economic reasons to minimize the incidental take of wild creatures in the course of our activities. The most serious instances of incidental take occur in fishing. Most fishing effort results in an accidental catch of fish other than the target species. Depending upon the degree of overlap between the target species and the non-target species this incidental catch can range from a negligible amount to a significant quantity. The incidental catch of salmon, for example, can reduce the catch of accredited salmon fishermen.

Where the incidental catch is valuable, the fishery may continue with the catches counted against the allowable catch for that stock. More common, however, is the adjustment of fishing gear, area or season, to allow for the escape of the younger age groups and the non-target species. DFO continues to develop new methods to reduce the incidental catch.

Seabird entanglement in commercial fishing nets on the Pacific and Atlantic coasts causes mortality which may be significant to some breeding populations, particularly on the east coast.

The catch of lobster and other shellfish are important to the economies of small communities on the east coast.
E.W. Manning, Environment Canada.

Some incidental losses may occur through mistaken identity by recreational hunters. However, there are sufficient regulatory instruments to restrict sport hunting of target species that resemble the species for which protection is desired. In controlling international trade in endangered species, members of CITES have made similar provision for controlling trade in "lookalike" species.

Furbearer trap lines in Canada are affected only marginally by non-target species being caught in the traps. In Quebec, research is conducted to maximize utilization of animals caught unintentionally. Organizations such as the Fur Institute of Canada and the Canadian Association for Humane Trapping have education programmes to minimize incidental catches.

11 Maintenance of the habitats of utilized species

Indigenous fauna and flora feature prominently in the cultural and economic activities of Canadians. Used primarily for recreational and commercial purposes, wildlife also play an important role in the subsistence of some people.

A recent national survey indicated that over 80% of adult Canadians took part in recreation related to wild animals in 1981, spending $4.2 billion in the process. In that year, 1.8 million people hunted wild mammals and birds and twice that number took trips (on which they spent $2.1 billion) to enjoy wildlife without hunting. These expenditures are estimated to support 185 000 jobs.

Three to four million furbearing animals of 20 species are trapped annually by up to 100 000 Canadians, about half of whom are Indians, Inuit and Métis. Altogether, these trappers are paid from $45 million to $85 million a year for the furs, and many of them depend on trapping entirely. The importance to Canada's native people of utilizing wild species is shown by the central place of wildlife issues in the negotiation of native land claims that is now underway.

Fish habitat provides extensive economic and social benefits throughout Canada. Commercial and recreational fisheries contribute more than $3 billion annually to the national economy. Other less tangible social benefits, such as support for traditional life-styles in small, remote communities, also flow from the fishery base.

The habitats for many of Canada's utilized species are stressed, some seriously. Agriculture, forestry, urbanization, and industrial activities over the last century have resulted in habitat loss and degradation, to the point that some utilized species have declined in numbers or have been contaminated. The most intense stresses are in southern Canada where human activity

is concentrated, particularly in the Great Lakes-St. Lawrence region, the prairies, and the coastal estuaries. Forestry in the boreal regions, petroleum developments in the north, and mining in both areas also modify habitats. The physical stresses include land clearing, drainage and filling of wetlands, flooding by dams, oil spills, siltation, soil erosion and compaction, and interruptions of habitat by forest clear-cutting and utility corridors. Chemical stress is introduced by industrial wastes, pesticides and herbicides, acid precipitation and heavy metals, and is carried into aquatic systems. Biological stresses include eutrophication and bacterial contamination (e.g. of shellfish) from sewage, and the introduction of disruptive exotic species, such as the lamprey in the Great Lakes. Fish and waterfowl appear to be the groups of utilized species whose habitat problems need most urgent attention. Potential climate change could be important to Canadian indigenous species. Longer or shorter seasons of biological productivity in all habitats could make a significant difference to populations that are at the northern edge of their range.

The management of habitat for utilized species is not new in Canada, particularly for game mammals and birds. One 1985 estimate is that the provinces and territories manage some 460 000 km^2 for wildlife (with hunting or trapping allowed on 70% of it), and that federally managed wildlife areas add more than 135 000 km^2 to that area. Ducks Unlimited, a private organization, has worked with Canadian governments and landowners to develop over 750 000 ha as waterfowl habitat in provinces and territories across the country, and in 1981 almost a million individual Canadians spent a total of $530 million on maintaining natural areas for wildlife. Fish habitat too has received special attention. Strategic Planning for Ontario Fisheries emphasizes, in northern Ontario, the maintenance of fisheries, and in southern Ontario, rehabilitation.

Considerable changes and achievements have occurred in habitat management, as government agencies and non-government organizations come to realize the present scale of the problems. These advances are in the knowledge of habitat status and requirements; dedication and management of special areas of habitat; environmental assessments and land use planning; development of habitat-compatible techniques for agriculture, forestry and urbanization; and control of contaminants and of harmful species introductions.

Canada is achieving a new awareness of the significance of habitat conservation. This is due partly to better information on the extent of damage to habitats. It is also due to new data on the socio-economic importance of the species thus jeopardized, which NGOs and individuals are bringing to the attention of politicians.

The last few years have seen a steady development of initiatives to protect, manage and rehabilitate special habitat areas on public and private lands. Among these are Heritage Marsh programmes in Manitoba and in Saskatchewan, which also has a new Wildlife Habitat Protection Act; Nova Scotia's 1985 Policy for Conservation of Wildlife Habitat; new wildlife policies in Alberta and Quebec, which prominently include habitat objectives; and a number of cooperative government-NGO landowner contact programmes, such as Ontario's Community Wildlife and Fisheries Involvement Programmes. Also, innovative funding mechanisms have been established like British Columbia's Habitat Conservation Fund; Quebec's foundation for the conservation and *"mise en valeur"* of wildlife and habitat; and at the national level, Wildlife Habitat Canada, a private non-profit organization which accepts funding from many sources (including a habitat stamp which is attached to hunting permits) and directs it to habitat conservation.

1m Careful allocation and management of timber concessions

Forests have unparalleled importance for the economic, social and environmental well-being of Canada. Forests are important in every province, and the forest industry is a major factor in the economies of most of them.

Forest resources are fully allocated in most provinces, and the only adjustments to be made are through re-allocation. Tenure of forest land forms the interface between the Crown and the industrial sector, as only 9% of forest land is privately owned. The provinces use various mechanisms for planning the use of forest resources. Ontario, for example, establishes forest management agreements by Order in Council. British Columbia administers similar timber supply areas and tree farm licences under its Forestry Act; this act also enables the minister to control both cutting and the exchange of cutting rights to protect the economic stability of resource-based communities in an area.

The allocation and management of forest resources are under review, because Canada's forests are in a state of transition. The high yielding old growth stands are giving way to second growth stands as the mainstay of the industry. This has profound implications for forest policies, because the yields from economically mature second growth stands are far lower than those from old growth, and because it is expensive to replant forests. For example in British Columbia the annual allowable cut, prescribed in 5-year Forest and Range Resource Analysis plans, is projected to drop from about 68 million m^3 to 66.2 million over the next 20 years and to 61.3 million over 50 years. This "fall-down" effect, evident in many regions of Canada, will be accentuated by unpredictable losses to pests, diseases and fire.

In 1985, Quebec announced a new forest policy that embodies principles of the WCS. In particular, the policy

Canada's productive old growth forests are dwindling, and are being replaced by less productive second growth.
S.S.C. Photo Centre A.S.C.

calls for a return to sustained utilization of forest resources that reflect the potential of forest land, and for a commitment to maintain the productive capacity of the resource base. The policy incorporates a forest land use plan, a prescription for appropriate silviculture practices, and guidelines for forest protection and resource utilization. Widespread losses among maple trees in Quebec appear to be correlated with airborne pollutants, and are of particular concern to the province because of the threat they pose to the valuable maple syrup industry.

Allocation and management of forest resources have become contentious issues in Canada, partly because timber harvesting reduces or temporarily eliminates certain other resources, values or uses of the forest, and partly because certain management practices, in particular pest management, are perceived to pose threats to the environment and even human health. The conflict has stimulated much open discussion, however, and a very considerable degree of understanding has been achieved among users with quite different interests.

In 1979, the Canadian Council of Resource and Environment Ministers decided on a national strategy to fund forest management. In the same year, the federal cabinet approved a policy paper entitled "Federal Policy on the Forestry Sector"; a subsequent policy statement entitled "A Framework for Forest Renewal" (September 1982) set out a plan to counter declining productivity. Federal-provincial cost-sharing agreements would enable accelerated regeneration of logged or naturally destroyed forests, and improved forest productivity through more intensive management. Five-year agreements were in force in every province in 1986, and totalled $1060 million in commitments.

Depending on specific provincial needs, these agreements may provide for reforestation (including the accumulated "backlog"), intensive forest management, silviculture, access, inventory and planning, industrial development, private woodlots, research, technology transfer, training, administration and public information. This means that in British Columbia, for example, the proportion of cutover and destroyed forest land to be planted will increase from 45% to 60% by 1987. (The remaining land is left to regenerate naturally.)

Canada's ability to limit losses from forest fires has been upgraded considerably through establishment of the Canadian Interagency Forest Fire Control Centre in 1982. The centre, supported by the federal government and all provinces, provides coordinated fire control through the Mutual Aid Resources Sharing Agreement; 29 aircraft were purchased for a cost-shared air tanker fleet. The federal government has also entered into pilot studies for resource planning and management on Indian reserves.

The use of forest resources is affected very much by markets for forest products. Increasing competition from other countries and a shortage of capital for upgrading mills have placed new stresses on Canada's forest economy. In September 1985, a new political forum, the Canadian Council of Forest Ministers (CCFM), was established and immediately called for a series of Canadian Forestry Forums, to be held during winter 1985-86, in which major issues would be examined by forestry experts. Each forum was held at a different venue, and drew participants from government, industry, labour, universities, and non-government organizations. Forum topics included labour market, multiple-use forestry and environment, forest management, and trade and investment issues. The forums have resulted in a series of recommendations to the CCFM, which has prepared a statement, based on these recommendations, for the National Forestry Congress held in Ottawa, 9-10 April 1986.

Canada is nearing a critical point for forest policy. The end of its old growth softwood timber is in sight and there is mounting pressure on provincial and federal governments to invest heavily in intensive forest management. For industry, too, changes are coming. The industry structure that has developed during the old growth liquidation phase may not be optimum once the cost of growing new timber crops has to be considered.

Despite many concerns, there is reason to be optimistic about the future of forestry in Canada. Effective mechanisms for coordinating effort across the sector and communicating with the public are in place, spearheaded by the newly-formed CCFM. Technology continues to make considerable strides in forest management practices, forest protection, and, in particular, more effective use of forest products. And as the Canadian Forestry Forums have shown, there is an encouraging level of mutual understanding among the various users of Canada's forest resources.

PRIORITY NATIONAL ACTIONS

2a Preparation and implementation of national and / or subnational conservation strategies

Canada has not developed a unified national conservation strategy. However, a long commitment to conservation has resulted in individual strategies and policies for natural resource sectors (fisheries, forestry, agriculture, etc.) and some cross-sectoral strategies at national and subnational levels. Some of these are explicitly modelled upon the three WCS objectives.

Examples of national and nation-wide strategies

The World Conservation Strategy: Federal Review provided a comprehensive review of federal undertakings in conservation. Drafted by DOE in consultation with other federal agencies and in direct response to endorsement of the WCS by the Canadian Council of Resource and Environment Ministers, the federal review makes 22 recommendations that call for a nation-wide response to the Strategy, and sets out a programme for implementation by the federal government. Adopting a cooperative approach involving many federal agencies, the review initiated a wide range of actions for the enhancement of conservation of living resources within the responsibilities of the federal government. These actions include development of national and regional strategies, management plans, guidelines, or reviews, as appropriate, for specific areas such as wildlife (migratory birds in particular), fisheries, forestry, genetic resources, national parks, water resources, climate services, reduction of airborne pollutants, prevention of damaging effects of toxic substances, environmental assessment, tax incentives, environmental law, environmental statistics, and communication of conservation philosophy to industry and the public. A progress report on the 22 recommendations was prepared in 1984 by DOE.

The *Federal-Provincial Wildlife Conference* provides an annual forum for representatives from all provinces and territories, the federal government, and three national conservation organizations to discuss and coordinate initiatives on wildlife issues. In 1982, the Conference unanimously endorsed *Guidelines for Wildlife Policy in Canada* which explicitly adapted the WCS objectives to the management of wild animals and their habitat.

A *Forest Sector Strategy for Canada* was approved by the federal cabinet in 1981. This strategy established a framework for ensuring sustainable development of forest resources by providing, in particular, for forest renewal, human resources, and enhanced research and development. Opportunities for forestry on native lands led to a cooperative programme involving native people, the Canadian Forestry Service and Indian and Northern Affairs Canada (see *Im*).

The final report of the *Inquiry on Federal Water Policy* (1985) is the first comprehensive assessment of the federal government's role in managing Canada's water resources. The 222-page report, *Currents of Change*, documents the extent and distribution of freshwater resources in Canada, examines the growing demands on supplies, trends in pollution, and assesses the adequacy of federal water policies and programmes. The authors recommend a National Water Conservation Programme, which would enable the federal government to initiate a variety of needed programmes in which the provinces and territories could participate flexibly but under consistent cost-sharing arrangements. Provinces and territories have been asked to respond to the report.

The goal of the *Federal Policy on Land Use*, approved by cabinet in 1980, is to ensure that federal policies and programmes, including management of federal lands, contribute to the wise use of Canada's land resources. Guidelines call for consideration of a wide range of land uses, including agriculture, forestry, habitat and water conservation, within a framework of integrated planning. The policy is coordinated through the Interdepartmental Committee on Land (see also *2c*).

Parks Canada Policy, approved by cabinet in 1979, set out the principles by which Parks Canada would develop policies. "Parks Strategic Review", approved by

cabinet in 1985, reaffirms the 1979 policy and establishes priority for implementation of parks in the North.

A *National Marine Parks Policy* has been prepared to accelerate the protection of Canada's marine heritage within the national parks system. A framework of 29 marine regions will guide selection of parks; feasibility studies are underway for sites in the Bay of Fundy, the Saguenay Fiord and Lancaster Sound. Four more sites will be surveyed in 1986-87.

The *Canadian Heritage Rivers System* was established by Parks Canada in 1984 to ensure conservation of the natural, historical and cultural values of Canada's important rivers. The system's board, which includes members of provincial and territorial governments, has received nominations of nine rivers to date.

The proposed *Fish Habitat Management Policy*, described in section *11*, establishes the principles underlying a nation-wide programme to protect, restore and enhance fish habitat.

In 1984, cabinet approved the concept of *"Managing Chemicals Better"* and established an Interdepartmental Committee on Toxic Chemicals. The committee will address the complexity of federal toxic chemical programmes, and prepare a 3-year action plan for priority issues.

Examples of regional, provincial and territorial strategies

Quebec has prepared a comprehensive statement entitled *"Contribution du Québec à l'atteinte des objectifs de la stratégie mondiale de la conservation"* (1986). The statement provides a detailed account of the province's policies, programmes and achievements within the framework of the WCS.

The Public Advisory Committee on the Environment (PAC) of the Environment Council of Alberta has committed itself to the preparation of a draft conservation strategy for Alberta. The PAC comprises about 130 Alberta non-government organizations, and has completed and endorsed unanimously a prospectus for such a strategy. The prospectus describes the ideas contained in the World Conservation Strategy and their implications for Alberta. This document has appended three additional objectives:

- To provide for the recreational, spiritual, aesthetic and other non-material needs of Albertans;
- To maintain and improve the quality of life in the urban environment; and
- To use and manage non-renewable resources in the interests of developing a long-term sustainable economy for Albertans.

In 1984 an *ad hoc* volunteer committee in British Columbia was organized to initiate actions towards the preparation of a British Columbia Conservation Strategy. Subsequently, a steering committee was formed which undertook the preparation of a brochure and questionnaire, to inform people about the concept of a BC conservation strategy. These were distributed to a wide range of interests from conservation to industry. The committee is currently developing a prospectus outlining strategy principles, concerns and general goals. The committee will seek the assistance of interested organizations and individuals. The strategy is scheduled for completion in 1987.

The Newfoundland and Labrador Wildlife Federation has organized a working group comprising representatives of government departments and environmental groups to address the objectives of the WCS. The working group has developed a draft proposal for a mechanism to achieve these objectives.

In 1985, the Government of Ontario provided funds to the Conservation Council of Ontario to review provincial conservation and development policies and programmes in the light of WCS objectives, and to make recommendations. A report is expected in the spring of 1986.

Manitoba and Ontario have pursued intergovernmental coordination on environmental matters through a Federal-Provincial Environmental Accord.

In 1982, the Commission on Pacific Fisheries Policy presented its strategy in *Turning the tide: a new policy for Canada's Pacific fishery*. The report contains a strategic framework for government implementation.

A procedural strategy has been outlined by DOE for the regional implementation of the WCS in Canada's eastern coastal and offshore areas. The plan advocates the adaptation of the WCS guidelines and review process to all government policies, programmes, and activities related to living resource conservation and development in the coastal zones of Atlantic Canada. The immediate goal is to ensure that the WCS objectives form a focus for future activities in this jurisdictionally complex but critical marine resource sector.

All provinces and territories have conservation strategies for individual resource sectors; these are described in other sections of this report.

2b Adoption of anticipatory environmental policies

An effective conservation strategy depends greatly on the ability to anticipate problems by accurate forecasting, and implementing timely counter measures. Policies of preparedness are not always readily accepted because they require action, usually at some cost, before crises are evident. Political support for anticipatory policies is crucial. Through a combination of scientific investigation, public awareness, education and object lessons at home and abroad, Canada has established many policies designed to anticipate problems.

The nature of effective anticipation is proactive rather than reactive. Anticipatory policies embrace a wide range of actions that include baseline studies, monitoring, environmental standards and assessment, and development of planning and management options. The two earliest steps, baseline studies and monitoring, tend to be less recognized and hence less supported than the more immediate concerns for planning and management. This has resulted in the erosion of fundamental research, evident in some sectors (see *2m*). On the other hand, numerous policies have emerged to address the pervasive threats of toxic, dangerous and environmentally damaging chemicals. Some examples of federal and provincial actions are reviewed in section *If*.

Recovery and recycling of both renewable and non-renewable materials can contribute significantly to sustainable use of resources. Quebec has placed particular emphasis on the recovery and recycling of paper, glass and aluminum.

Environmental standards have been established for many activities affecting natural resources at national, regional and local levels. The importance of roads and access has received particular attention: Environmental Standards for the Construction of Forest Roads and Fire Ponds in Nova Scotia (1983) was written primarily for woodlot owners with a view to minimizing damage to water and fish resources. Environmental Construction Practice Specifications for Nova Scotia (1981) stipulates approved highway construction practices to minimize the risks of damage to fish habitats and the aquatic environment.

Policies that underlie weather and climate-related services provide important contingency support in environmental emergencies such as oil spills and gas leaks, forest fires, and weather extremes, as well as background information for resource planning and pollution abatement. Perhaps the most significant environmental issue confronting Canadians, and indeed much of humankind, is the possibility of a dramatic change in climate over the next century. Even without the forecast rise in temperature, geographic and year-to-year variations in climate are of great consequence to conservation strategies. A cooperative climate programme involving federal and provincial governments, universities and industry has been established at the national level, under the direction of a national planning board, to promote the recognition of climate as a natural resource, and its use in ecosystem management programmes and related socio-economic activities. The climate programme includes a number of cooperative regional climate centres.

Lands burned by a forest fire in the Northwest Territories.
S.S.C. Photo Centre A.S.C.

In conclusion, attention is drawn to the potential that tax and other financial incentives may offer in attaining the goals of conservation. For example, the Department of Finance, in consultation with the Department of Energy, Mines and Resources, recently extended indefinitely, provisions to write off quickly certain energy conservation equipment used by businesses in Canada. There are many other anticipatory elements embodied in multi-jurisdictional planning, rational allocation of resource use, and technological developments that contribute to conservation in Canada. They will be found throughout this report.

2c Adoption of a cross-sectoral conservation policy

Of all the national actions required by the WCS, the adoption of a truly cross-sectoral conservation policy

represents the greatest challenge to Canada's governments. There can be no doubt that federal, provincial and territorial jurisdictions are committed to the principles of conservation; each has defined its objectives for the various resource sectors for which it is responsible, and as will be illustrated below, is fully cognizant of the need to maintain species and ecosystems as well as to capitalize on them.

Despite good intentions, however, government policies and programmes in general have yet to be based on an ecosystem framework. The obstacles are formidable. Critical issues in resource sectors have polarized attention on actions within the sectors; responsibilities for resource sectors are divided among different levels of governments; and, resources are by no means evenly distributed among Canada's 10 provinces and two territories. Nevertheless, recent advances in resource sciences, coupled with public demands for non-traditional uses of land and water, have drawn government attention to the importance of a cross-sectoral approach to conservation policy. Whether a fully national cross-sectoral policy is possible in Canada, at least in the near future, is open to doubt, given the extent and complexity of existing jurisdictions, policies and programmes. The need exists, however, and is recognized in numerous government and non-government initiatives. Some of these initiatives are examined below.

Faced with its many responsibilities for conservation, the federal government has undertaken a number of cross-sectoral activities. In 1972, the government presented Conservation in Canada: Natural Resources and Historic Sites, to the UN Conference on the Human Environment in Stockholm. The original work was expanded and revised substantially into a now-widely circulated 441-page book entitled *Conservation in Canada*.

In 1980, Cabinet approved the Federal Policy on Land Use (FPLU; see *2b*). The goal of this policy is to ensure that federal policies and programmes, and the management of federal lands contribute to the wise use of Canada's land resource. Such concerns as the preservation of high quality agricultural land, the maintenance of public access to recreation lands, the sound management of land used to produce renewable resources, and the encouragement of the wise use of hazard-prone lands are included in the policy. It provides a series of policy statements and guidelines which should be applied in the planning and administration of all federal government programmes with respect to land use.

An Interdepartmental Committee on Land (ICL) was constituted to oversee implementation of the FPLU. Membership of the ICL includes Agriculture Canada, Transport Canada, Treasury Board, Indian and Northern Affairs Canada, Canada Mortgage and Housing Corporation, DOE, Public Works Canada, Energy Mines and Resources Canada, Finance Canada, DFO, Regional Industrial Expansion, Canadian Forestry Service and Tourism Canada.

In direct response to the WCS, the ICL has undertaken to develop guidelines for federal policies and programmes so that they help to:

i) maintain prime agricultural land,
ii) prevent soil degradation,
iii) protect ecologically important sites, and
iv) protect important habitats for wildlife.

Also in direct response to the WCS, DOE has promoted the three objectives of conservation at the federal level. Achievements to date include a federal network of contacts, including those for implementing the 22 recommendations of the federal review of the WCS, and a progress report. The recently prepared Renewable Resource Conservation Policy addresses directly the principle of integrating conservation of resources with their development, and is widely recognized as a sound basis for other resource strategies.

Several other federal initiatives are relevant. In 1983, DOE published a substantial report entitled *Stress on Land in Canada* that examined the pressures on the land resource from a cross-sectoral viewpoint. Statistics Canada has studied human activity and the environment, using a pioneering ecological framework for analysis, and, jointly with DOE, has conducted a "State of the Environment" survey of Canada.

Also at the national level, the sponsorship and support of sectoral conferences are indicative of considerable achievements in establishing understanding across sectors. For example, the 1984 Wildlife and Forest Management Symposium, Vancouver, was supported by the Canadian Wildlife Federation and the Canadian Forestry Association; the 1985 "Woodshock" Conference, Toronto, on forestry issues, was sponsored by the Sierra Club of Canada.

The provinces and territories have developed numerous mechanisms to deal with the jurisdictional and operational needs of conservation. Most major resource policies of British Columbia are coordinated through the Environment and Land Use Committee (ELUC) of cabinet; the committee includes ministers responsible for resource development, resource conservation and community development. Established under the Environment and Land Use Act, the committee develops resource policies that integrate economic development and environmental protection. Deputy ministers of the departments represented on ELUC, constitute an Environment and Land Use Technical Committee, to which conflicts in resource use are addressed. A Special Advisory Com-

mittee on Wilderness Preservation was appointed in 1985 to examine the respective needs of wilderness protection and economic development.

Other jurisdictions have taken parallel actions. In Manitoba and Ontario, provincial land use committees provide advice, initiate, and coordinate land use policies in areas of provincial concern. New Brunswick is developing a coordinated provincial approach to land and water management issues. Regional policies and programmes for conservation are described in other sections, but attention is drawn to Alberta's Eastern Slopes Resource Management Policy, an integrated programme that reflects public interest in conservation and development of the province's substantial forested areas; integrated resource plans are also being developed for several areas where energy resources are being developed. New provincial policies in the resource sectors show increasing emphasis on the need for an integrated approach to resource management. Forest policies in Quebec and Nova Scotia provide for a wide range of resource values, including fish and wildlife habitat, water quality, recreational needs, and tourism.

Regional programmes provide assurance that difficulties posed by sectoral and jurisdictional complexities can be overcome. Under the Fraser River Estuary Management Programme, DOE, the province of British Columbia, municipalities in the region and Indian bands have collaborated on a plan to ensure sustainable use of the many resources of the estuary.

In conclusion, attention is drawn to the substantial level of bilateral and multilateral assistance that Canada contributes to resource development and conservation overseas. To a large extent, the complexities posed by the presence of numerous governments, international organizations and sectoral interests are addressed by the Canadian International Development Agency. The agency is aware of the need to incorporate conservation principles into its projects and continuously reviews its policies and programmes accordingly.

2d Inclusion of non-monetary indicators of conservation performance in national accounting systems

The costs of conservation and of measures to enhance human welfare often appear to outweigh the benefits, particularly as the costs are calculable in monetary terms whereas the benefits often cannot be so easily quantified. The WCS recommends that non-monetary indicators of conservation performance be selected for inclusion in national accounting systems in order for governments to take adequate account of the costs of destroying, degrading or depleting living resources and the benefits of conserving them. This is an action which Canada has not addressed in terms of its national accounting system. However, British Columbia and Manitoba have indicated their interest in pursuing this action.

Canada must first identify the types of measures that can be used to determine the state of important national assets. The selection of ecological indicators must be considered carefully to ensure that their measurement and monitoring is feasible and that in combination they provide a reasonable reflection of conservation performance. The task has been studied by Statistics Canada in recent environment analyses (see *2c*).

2e Preparation of ecosystem evaluations

Canada has conducted extensive ecosystem evaluations through joint federal-provincial programmes. Under the Canada Land Inventory (CLI), a comprehensive study of current land uses and land capability assessments was made of the 2.6 million km^2 associated with both the nation's prime resource lands and the main population centres in southern Canada. The CLI classifications include: agriculture, forestry, recreation, waterfowl, and ungulates. This information has provided a regional planning base for specific kinds of use as well as for interdisciplinary uses. When the CLI was completed in the late 1970s, the Canada Land Use Monitoring Programme was implemented to evaluate and report on land use changes especially in prime capability areas.

The Canada Committee on Ecological Land Classification (CCELC) has served as a coordinating agency for ecosystem evaluations within the CLI area and throughout the rest of Canada. The recent report *Canada's Environment: An Overview* has adopted innovative ecosystem reporting units. These "ecozones" will be used to provide a comprehensive overview of conditions and trends in the natural environment and human health. A more detailed framework using "ecoregions" and census divisions is being researched. The CCELC and various provincial agencies are particularly concerned with interdisciplinary methods of describing ecosystems.

The province of Quebec has developed expertise in the mapping and classification of ecological areas. Environmental resource planners and managers recognize the importance of the integrated resource management concept and the need for a comprehensive knowledge of the ecology of the management area. Quebec assists resource managers in ecological assessment, cartography and land classification. A methodology has been developed to build an ecological data base to be used by the "municipalités régionales de comté" for the preparation of their regional development plans. Ecological mapping projects have assisted regional resource managers in the integration of ecological data into forest management plans.

British Columbia has extensive biophysical and soil surveys and has initiated a programme to establish ambient air and water quality objectives using an integrative ecological approach. The objectives are based on scientifically established criteria for the physical, chemical and biological constituents, ensuring that the basic ecological processes dependent upon these environments can be sustained.

Six provinces and the federal government operate centres for remote sensing, which provide expertise to users in government, industry and universities. Applications include forest inventory, pest damage assessment, regional geological mapping, crop inventory, water quality studies, and environmental monitoring and assessment.

2f Advance assessment of the likely environmental effects of all major actions

Recognition of environmental assessment as an integral element of development projects and other major actions was initially formalized in 1973, when cabinet established the Environmental Assessment and Review Process (EARP) for assessment of all activities of the federal government.

Provinces make provisions for formal environmental assessment, with varying degrees of public hearings and consultations incorporated. New Brunswick and Ontario each adopted formal Environmental Impact Assessment Policies in 1975. In Quebec, Certificates of Authorization are issued for projects meeting publicly accepted environmental standards.

Newfoundland's Environment Assessment Act, passed in 1980, requires the proponent of any single resource use project to give detailed consideration to alternatives relative to other resource uses and locations. Under the provisions of the Saskatchewan Environmental Assessment Act of 1980, a project may be declared a "development" if it is likely to "have an effect on any unique, rare or endangered feature of the environment," or if it is likely to have a serious impact on resources or the environment. If judged a development, a project becomes subject to the environmental impact assessment process, and ministerial approval under the act is required.

Public consultation is an essential ingredient of successful environmental assessment processes, including formulation and amendment of regulations. A proposed regulatory basis for environmental assessment in New Brunswick will be subject to extensive citizen review and public hearings in 1986; the regulation will be based on a 1983 amendment to New Brunswick's Clean Environment Act. The new regulations will extend to private sector and municipal projects.

In common with other cross-sectoral processes, the effectiveness of environmental assessment is often influenced by the tangled responsibilities for environmental protection and resource management and use in Canada. Recognizing this, the Federal Environmental Assessment and Review Office (FEARO) has reviewed EARP as part of its response to the WCS. Recommended changes to EARP came into effect by Order in Council in June 1984. International implications are considered and there is greater public access to decisions taken under EARP. Although public reviews are flexible, there are now published standard procedures. Panel recommendations that are accepted must be made public. To avoid duplicate public reviews when a proposal is of interest to both federal and provincial or territorial governments, FEARO may negotiate cooperative reviews with other levels of government.

The Canadian Environmental Assessment Research Council was established in 1984 to advise government, industry and universities on ways to improve the scientific, technical and procedural basis for environmental impact assessment in Canada. Specific research themes include methodology for decision making, and identification of procedural difficulties.

2g Adoption of a procedure for allocating land and water uses based on ecosystem evaluation and environmental assessment

Despite Canada's size, land use has been almost fully allocated, at least in the more productive regions. There remains considerable scope, however, for rational allocation of land and water uses in the highly sensitive northern areas (see the North), and also for reallocation of uses in the south, especially as management and utilization become more intensified.

The concept of allocation of use based on ecosystem capacity must be applied at every opportunity if sustainable production is to be realized. As the record of cropland losses in Canada illustrates (*1a*), there have been many instances where it has not. The potential of biophysical frameworks for land and water use has been recognized by provincial, territorial and federal governments, with the development of several national or regional classification systems (see *2e*). But procedures for allocating land and water use within these frameworks have not been adopted consistently. Difficulties have been posed by existing land use patterns, traditional uses and socio-economic pressures (particularly those resulting from urban development). In the case of sectoral assessments of land capability, scales of mapping have not necessarily corresponded with those

needed for operational planning. On the other hand, several regional frameworks have been adopted, and are used successfully as a basis not only for land allocation but also resource management; examples from British Columbia, Ontario and the Maritimes can be cited. Furthermore, even though comprehensive allocation of land use may seem to be impracticable, Alberta, New Brunswick and other jurisdictions have shown that integrated land use and resource planning is still possible, and critical habitats and other important land can be zoned for protection.

This priority is widely accepted by government, industry, universities, professional bodies and environmental non-government organizations as an ideal to be pursued whenever possible. Actions to increase productivity, if not consistent with the inherent capability of land and water, can have devastating consequences for sustainable development.

2h Review and strengthening of legislation concerning living resources to ensure that it provides sufficiently for conservation, paying particular attention to enforcement

Only governments can strengthen legislation in Canada, but reviews of legislative tools for conservation are undertaken, as the needs arise, by every kind of group – government agencies, opposition parties, appointed advisory bodies, non-government organizations and academics. The reviews and their results are uneven across the country, but telling questions have been asked in different jurisdictions. Does the scope of existing conservation laws include all living resources and essential ecological processes, and all significant threats to their conservation? Do those who are interested in the outcomes have access to decisions which affect conservation and can they invoke the relevant laws? How well are the laws applied and complied with?

Many of the measures described elsewhere in this report (e.g., the environmental assessment procedures described in section *If*) have been taken to overcome weaknesses identified by legislative reviews. Some further recent initiatives are outlined here.

Because resource conservation is a matter of public interest, academics and public interest groups in Canada have developed model legislation from time to time for consideration by governments. Model laws have been prepared notably for environmental assessment, for endangered species protection, and for ecological reserves, and these models have been useful to different jurisdictions in developing their own legislation.

Aiming at a fundamental legal level, the Canadian Environmental Law Research Foundation prepared a report and recommendations in 1984 for an Environmental Bill of Rights for Canada. Such a bill could formalize public rights to a healthy environment and to benefits from the use of natural resources held in trust by the government. It could also establish mechanisms to achieve environmental quality such as "the right of any person, regardless of property or pecuniary interest, to bring a court action". Provincially, Ontario is considering a measure to permit class action suits, a method for the general public to pursue environmental offences. Quebec has permitted class actions since 1979. Also at a fundamental level, the Canadian Law Reform Commission's Working Paper No. 44, "Crimes Against the Environment", recognizes the seriousness of present environmental threats and proposes that the criminal code be broadened so that activities causing damage to human health or the environment will, in certain circumstances, be punishable as crimes.

Review and strengthening of legislation concerning living resources in Canada is necessary to ensure that it provides sufficiently for conservation.
Environment Canada.

Conservation legislation is strengthened in some cases by bringing the responsibility for management and compliance closer to the people who use resources or have effects on them. A proposed amendment to the federal Environmental Contaminants Act would distribute responsibility for safeguarding environmental quality more

widely by shifting the onus of proof: companies that intend to introduce new substances to the environment would have to show them to be safe, rather than the regulatory agency having to prove them unsafe. In another area, the recent entrenchment of aboriginal rights in the Constitution and the native claims negotiations now underway will result in a stronger legal recognition of the roles of native people in managing the living resources on which they have traditionally depended.

A gap has been identified in the combined legal ability of the provinces, territories and the federal government to regulate the interprovincial transport of wildlife, and this is to be addressed by new federal legislation. The proposed law will also improve Canada's ability to control the export and import of wildlife, particularly to safeguard Canadian ecosystems from the introduction of harmful exotic species of wild animals.

The Federal Statutes Compliance Project is currently studying ways to improve compliance with federal laws, including those aimed at conservation. One interesting suggestion is that other means (such as better definitions of acceptable behaviour) may be just as effective as tougher prosecution in achieving compliance with the laws. Nevertheless, there are current proposals to provide for significant increases in the levels of fines under federal legislation for conservation of fish and other wildlife.

A final area is the review of legal and regulatory measures which serve some resource management aims but unintentionally frustrate others. Some agricultural subsidies, for example, unwittingly encourage the conversion of good wildlife habitat into marginal farmland. Investigations of this issue and of the complementary possibility of tax incentives to encourage conservation of wild species and their habitats are being initiated by organizations such as Wildlife Habitat Canada.

2i Review and improvement of the status, organization, funding and staffing of agencies with responsibilities for living resources

The factors affecting the distribution, utilization and state of natural resources seldom conform to jurisdictional boundaries. Thus, multi-layered government structures such as Canada's may complicate the development and implementation of strategies for the wise use of these resources. In 1964, the provincial and federal governments established the Canadian Council of Resource Ministers. In 1971 it became the Canadian Council of Resource and Environment Ministers (CCREM). The purpose of CCREM is to provide a national forum for the examination of resource and environment issues, and for the coordination of policies and programmes that address them. CCREM and the recently established Canadian Council of Forest Ministers have proved to be effective mechanisms by which governments can implement resource strategies.

The status of any provincial, territorial or federal agency is always subject to review. Most jurisdictions call for periodic reports on the state of resources and resource management; in the province of Manitoba, for example, reports are prepared every five years.

2j Establishment of a soil and water conservation body at the policy making level

Canada does not as yet have a national soil and water conservation body at the policy making level. However, the need for such a body has been identified by the Standing Senate Committee on Agriculture, Fisheries and Forestry in their report, *Soil at Risk: Canada's Eroding Future*. The report indicates that it is time for action, and recommends:

- *"That a comprehensive federal soil and water conservation policy for Canada be developed and adopted immediately. It must (a) clearly state the federal government's intention to make soil conservation a priority in the development of all its policies, programs or projects; and (b) require all departments to coordinate their efforts to make the most efficient use of resources and information.*
- *"That provincial governments also develop comprehensive soil and water conservation policies".*[1]

The Agricultural Institute of Canada submitted a "Strategy for Soil and Water Conservation in Canada", to the House of Commons Committee on Agriculture in which they identify the need for a holistic approach in which all of the 'players' cooperate to use the limited resources available most effectively. The approach includes assessing regional problems, evaluating research required to develop the necessary cropping systems and changing policies to encourage the new approach. They urge the Canadian government to take the initiative to develop a new federal-provincial agreement for a cost-sharing programme to ensure the conservation of Canada's soil and water resources.

Provincial Conservation Authorities have been in existence for many years. In Ontario, for example, such authorities have a mandate to establish and undertake programmes designed to further the conservation, restoration, development and management of natural resources other than gas, oil, coal and minerals. Their areas of jurisdiction are defined by watershed boundaries and their activities focus on both land and water.

[1] Standing Senate Committee on Agriculture, Fisheries and Forestry 1984, *Soil at Risk: Canada's Eroding Future*, Ottawa.

2k Establishment of new organizations or of special measures to coordinate existing ones for the comprehensive management of marine living resources

The WCS calls attention to the special need for a coordinated approach to conservation of marine resources in which the ecosystem provides the fundamental unit of management. A large proportion of Canada's marine species require coordinated regional strategies involving the US and other countries; these are examined in sections *3h* and *3n*.

In 1977 Canada, along with its neighbours, the US, Denmark (Greenland), and France (St. Pierre and Miquelon), extended its fisheries jurisdiction to 200 miles, dramatically changing the control of the groundfish fisheries in the northwest Atlantic. The Northwest Atlantic Fisheries Organization (NAFO) has managed the stocks that straddle the 200-mile limit (primarily those on the Grand Banks), and the discrete stocks that occur east of the 200-mile limit. The conservation of stocks within the 200-mile zone has been put on a scientific basis, through the Canadian Atlantic Fisheries Scientific Advisory Committee established in 1977. These organizations are currently addressing the management needs of marine living resources. However, special measures have been taken to address broad, regional aspects of conservation, as illustrated by the Fraser River Estuary Management Programme (*2c*), Northern Land Use Planning and the Arctic Marine Conservation Strategy (see the North). Management of the Great Lakes has been reviewed repeatedly for many decades; measures resulting from these reviews are examined in section *3m*.

2l Review and strengthening of training facilities at the professional, technician and user levels

Canada's long dependence on its resource industries has led to the development of a comprehensive network of training facilities and programmes that include universities, technical colleges, and on-the-job training in both industry and government. Although refinements are needed in specific areas, particularly where technological change is rapid, Canadian facilities are generally considered adequate for training researchers, other specialists, and technicians. Extension programmes at universities and colleges, and within government departments, exist to convey the principles of sustainable resource management to farmers, fishery workers, forestry workers and other resource users. Enrolment in certain training programmes has declined in recent years, reflecting perceptions of diminishing job opportunities in these sectors. Whether or not they continue, such short-term trends are inconsistent with the need to strengthen resource management in the long run.

There remains a great need in all sectors for staff trained in integrated resource management; several universities have responded by developing necessary programs, but extensive on-the-job training of existing staff is also needed.

Canada provides training facilities to meet needs in developing countries, through Canadian and overseas institutions. Federal agriculture, fisheries and forestry establishments have provided training programmes for nationals of many countries; various programmes enable Canadian experts to participate in FAO and other training projects (Canadian University Students Overseas enables students to participate in these projects). The Canadian International Development Agency is reviewing its programmes to ensure that nationals are fully trained to assume responsibility for projects after completion of the initial support phase.

2m Increased research to improve the management of living resources

Adequate scientific information is fundamental to wise use of natural resources. Canada has a long and renowned history of research in agriculture, fisheries, forestry, environmental science, and wildlife management. Our reputation has been built on extensive networks of government, university and industrial facilities and expertise. Unfortunately, our ability to conduct effective research is in jeopardy as a result of spending restraints. With few exceptions, research to improve management of living resources is being reduced, not increased. Whether this trend can be reversed is difficult to predict, for funding agencies do not appear able or willing to expand research during periods of economic uncertainty; yet it is through research that opportunities for economic development emerge.

The mission-oriented emphasis of research in recent years has impaired our ability to maintain an adequate knowledge capital. Much of the technological development witnessed has been based on existing information. The paucity of fundamental research is particularly acute in living resource management because the biological systems on which these resources depend are highly complex and very poorly understood. Even if the private sector is able to undertake a greater share of research, as governments are suggesting, the prospects for enhanced scientific investigation of ecosystem dynamics and other basic topics remain poor.

Given the discouraging state of living resource research in Canada, the mechanisms for review of research planning and spending assume great importance. Each natural resource sector has, in fact, recognized this and has established advisory committees at various levels. Examples include the Forest Research Advisory Council, the Fisheries and Oceans Research

Research plays a major role in the effective utilization of forest genetic resources.
Canadian Forestry Service.

Advisory Council, and specific advisory committees established for agricultural commodities.

Furthermore, there will be a particular need to ensure that duplication of effort is minimized, and that research efforts are fully coordinated through the many elements of each sector. In view of the importance of cross-sectoral influences in living resource management, such coordination must extend beyond each sector. Again, there are encouraging signs that this is being done. And under current conditions, it becomes particularly important that available scientific information is synthesized, disseminated and effectively utilized.

Despite widely felt reductions in spending, Canadian institutions have been able to respond to special needs. For example, several major industrial, government and university initiatives have launched Canada's biotechnology programme; joint federal-provincial support has been given to climate studies, and Canada has developed world-class capability in climate modelling; research has led to a new crab fishery on the east coast and enhanced salmon survival on the west coast. Nevertheless, support for research into natural resources in general has not improved significantly. The number of federal research scientists employed in Agriculture Canada, DOE and DFO fell from 1424 in 1979 to 1392 in 1984. Prospects for the future are not improved by the increasing average age of scientific populations in many departments: recruitment is not keeping pace with retirement. Furthermore, the ratio of technicians to scientists has fallen in many departments.

It is reassuring to note, however, that expenditures on research and related activities for overseas development have increased, in the case of the International Development Research Centre, from $42.6 million in 1982 to $79.3 million budgeted for 1986.

2n Greater public participation in decisions concerning living resources

Public participation has emerged as an indispensible element in effective resource planning and management. Originally conceived as a mechanism for obtaining local views on complex issues, public participation provides a safeguard against ill-informed decisions, educates the public and decision makers alike of each others' concerns, builds public confidence and understanding, and provides new and valuable information to planners and policy makers.

Although public participation has been practiced in some sectors and in some government agencies for many years, there is now a rapidly expanding recognition of the role the process plays in dealing with highly complex cross-sectoral issues. At the municipal level, public participation has been a long-established principle. Conversely, public participation at the federal level is an evolving process, although DOE and DFO, for example, have conducted successful consultations on environmental and resource issues for several years. However, it is at the provincial and territorial levels, where many resource planning and management decisions are made, that the process has particular impact. All jurisdictions now provide for public participation in resource decisions, although the legislative base for such provision is quite variable. Examples are drawn from Alberta and Manitoba.

Water allocation in the South Saskatchewan River Basin is fundamental to Alberta's future development; major policy questions regarding conservation and development opportunities were addressed through public hearings conducted by a recently-formed Water Resources Commission. The Eastern Slopes Policy (see *Id*) was developed through public hearings carried out by the Environment Council of Alberta, and itself calls for wide public consultation; the siting of a special waste treatment plant at Swan Mills was the result of public consultation combined with technical evaluation. In Manitoba, the Clean Environment Commission and the Manitoba Environmental Council (see *If*) both provide important mechanisms for public participation. Public access to government officials and the Minister is open and encouraged through regular consultations.

Public participation is regarded as essential for effective resolution of resource issues. At the same time, it is recognized that the participating public must be informed, and be given ready access to understandable, comprehensive and unbiased sources of information. These important qualifications are examined in *2o*.

2o Environmental education campaigns and programmes, particularly for the users of living resources, legislators and decision makers, schoolchildren and students

An informed public is a key element in planning, allocation, use and management of living resources, and a prerequisite of effective public participation in decisions affecting these activities. The task as outlined by the WCS is large, yet in many respects, Canada has made impressive progress. The majority of resource users, whether individuals such as farmers, some fishery workers and recreational users, or groups (chiefly companies), have access to information. Furthermore, most of these people have had basic training in management of the resources they are using, although it is to be admitted that integrated resource management will necessitate revision of many programmes. Universities, colleges and some government departments offer excellent extension programmes in a variety of resource management topics that are open to the public.

The important decision-making groups of legislators, administrators, developers, industrial and commercial leaders, and trade union officials are seldom exposed to principles of natural resource conservation and management, and present an important challenge for environmental education. Several events in Canada have served to heighten awareness among these groups, however, including the negative impacts of local and long-range pollutants, and the positive publicity achieved by the World Conservation Strategy Conference in Ottawa and several public hearings, notably of the Brundtland Commission in 1986 and the Inquiry into Federal Water Policy in 1984-85.

Most jurisdictions have established facilities for exposing schoolchildren to the fundamentals of conservation and resource management, although few school curricula feature directly related courses. Federal, provincial and territorial governments have developed a wide range of activities that address different sections of the public. The province of Quebec, for example, provides education programmes within four ministries dealing with natural resources. Recent activities include PARFAIR, a programme to support community associations for recycling; support for ENJEU, an environment youth movement aimed at enhancing the ecological conscience of young people; an audiovisual show, "Rendez-vous avec les arbres" that was featured in about 50 municipalities in 1984; technical documents and

Children have an opportunity to learn about the wetland environment through outdoor education programmes at interpretation centres. Canadian Wildlife Service, Environment Canada.

meetings on acid rain and other issues; an environment week whose theme in 1985 was "Préserver, une action pour l'avenir"; a conservation week; implementation of an environmental education policy through park activities; a network of eight forestry centres contributing to a forestry information programme that reaches, directly or indirectly, a million people; and special environmental campaigns on topics such as the rational use of pesticides. New Brunswick has found it necessary to prepare environmental education materials with a more regional and rural orientation than is provided in many sources.

It is to be noted, too, that non-government organizations make a particularly important contribution to public awareness and education, often being able to present information from a quite impartial standpoint. World Wildlife Fund Canada, Sierra Club of Canada, the Canada Nature Federation and the Canadian Wildlife Federation are among outstanding performers in this regard.

Public education is a continuous process for all agencies and for all people. That it has much to achieve is widely recognized by government, industries and educational institutions alike; there is also a widely-perceived need for improved methods.

2p Rural development combining short-term measures to ensure human survival with long-term measures to safeguard the resource base and improve the quality of life

This action is viewed in the context of developing countries; Canada's contributions are summarized under international actions.

Scenic view of the Yukon River between Dawson City and Clinton Creek, Yukon.
George Hunter, S.S.C. Photo Centre A.S.C.

Traditional hunting of caribou provides both food and clothing for the Inuit.
Canadian Wildlife Service, Environment Canada.

The North

Introduction

Lying north of the sixtieth parallel, the Yukon and Northwest Territories (NWT) cover 3.9 million km^2 – 40% of Canada's land area. Although much of the North is still relatively free from human interference, recent and proposed developments of its hydrocarbon, mineral and hydroelectric resources have raised issues regarding renewable resource conservation.

Certain ecological processes and life-support systems have characteristics peculiar to the North and require special consideration in conservation. For example, biological productivity is often concentrated into particular ecosystems, such as estuaries, coastal shallows, inland wetlands and lowlands, ocean upwellings and polynyas. On the other hand, some animals migrate over extensive tracts of land or sea; caribou, some marine mammals, and anadromous fish are important examples. Most freshwater systems have low productivity, and are slow to recover from disturbance, such as may be caused by river transportation (an important part of northern development). Permafrost, underlying much of the North, is a major factor of vegetation and land surface structure, and is especially sensitive to disturbance. Finally, marine ice is a major ecological variable, and determines the status of many species of wildlife, including seabirds, polar bears, seals and whales.

Fewer than 100 species of mammals and 100 species of birds are known to reside (for at least part of the year) in the North. For many of these species, populations are quite low. For others, the populations may be restricted to isolated concentrations in specific places at particular times of the year. Some northern species and subspecies have been officially declared as endangered or threatened, including the bowhead and North Pacific humpback whales, the Eskimo Curlew, Peregrine Falcon and the Whooping Crane. Other northern species occur in numbers which represent major proportions of the total world population, such as grizzly and polar bears, barren ground caribou, and chinook salmon.

The continued reliance of the majority of northern communities on renewable resource harvesting adds a special dimension to wildlife conservation in the North. In addition to supplying food and commodities, traditional activities such as hunting and fishing are central to native peoples' culture, and their community and family lives, and renewable resource harvesting also provides stability to the northern economy. Sustainable yield becomes an issue when use levels approach the replacement levels of a specific population. For certain species, such as some subpopulations of walrus or polar bear, harvests may be approaching or surpassing sustainable limits, and

require immediate conservation measures. In some areas, the problem is further complicated by losses of animals due to predators, prompting the institution of predator removal programmes.

Progress and Achievements

1) A framework for a comprehensive conservation policy and a strategy for its implementation have been developed.

The Report of the Task Force on Northern Conservation (1984) embodies the objectives of the WCS, in the context of conservation and resource management in northern Canada. It has been endorsed by the federal and territorial governments. This report represents the culmination of work initiated by Indian and Northern Affairs Canada (DINA) in the form of a discussion paper entitled *A Comprehensive Conservation Policy and Strategy for the Northwest Territories and Yukon* (1982), and a Northern Conservation Policy Workshop (Whitehorse, Yukon, 1983). The task force, whose membership represented industry, conservation, native interests, territorial governments and federal government, proposed adoption of a strategy consisting of two mutually supportive components: a system of integrated resource use and a comprehensive network of areas that require special protection. Like the WCS, the task force sees conservation as embracing both development and protection of the North's natural resources.

Follow-up to the task force recommendations has begun.

1. Federal and territorial governments have agreed that an arctic marine conservation policy is a high priority; DFO is developing one.
2. The feasibility of a system of protected land, freshwater and marine areas in the NWT is being investigated.
3. The potential in the North for agreements between governments and the private sector to meet conservation goals is being evaluated.
4. Governments of both the NWT and Yukon are starting to prepare conservation policies based on principles, goals and broad strategy set out in the task force report.
5. NWT legislation is being reviewed in preparation for the establishment of protected areas. The forms of protection are being adapted to the North, and new legislation is being developed where required. The system for administering land and water is also being analyzed, and alternative models developed. Guidelines for land use planning in the NWT have been drafted, which will facilitate decisions about resources. The Government of the NWT and DINA are developing a water management policy.
6. The Yukon Territorial Government is reviewing existing renewable resource policies and programmes. It has prepared *The Future of the Yukon's Renewable Resources* to promote discussion during territory-wide hearings. The paper describes the status of each resource and the major resource management issues and proposes policies and programmes that could be used to carry out the recommendations of the Task Force on Northern Conservation. Based on the public's response and a review of information, recommendations will be presented to the legislature, and a strategic plan for renewable resources will be prepared. The Yukon Territorial Government is also reviewing and rebuilding its Wildlife Act and strengthening its public consultation mechanisms. Contractual agreements for wildlife harvesting have been instituted on a pilot basis with outfitters, who now harvest grizzly bears on a point quota system under the terms of a multi-year agreement with the Yukon government.

The Inuit Tapirisat of Canada is cooperating with the Inuit Circumpolar Conference (ICC) to produce the Inuit Regional Conservation Strategy, an application of the WCS to the circumpolar region. This strategy will provide a vehicle for international efforts to maintain the quality of the arctic environment. The ICC is preparing an outline of the strategy for their general assembly in 1986. ICC has also proposed an Inuit Arctic Marine Environmental Policy, to encourage a comprehensive approach to marine management and cooperation between government and Inuit.

Environment Canada published *Environment Canada and the North* (1983) outlining the department's perceptions of its roles and policies regarding the incorporation of conservation into all aspects of northern development. Objectives include establishment of protected areas, promotion of environmentally safe operations in resource development, sustainable use of renewable resources, and increased public information and consultation.

2) Programmes and agreements to achieve conservation goals are being implemented.

The Northern Land Use Planning Programme, approved by Cabinet in 1983, is considered by the Task Force on Northern Conservation to be the basic mechanism through which a Northern Conservation Strategy can be implemented. The programme is being implemented in the NWT following the 1983 signing of a multilateral agreement by DINA, the

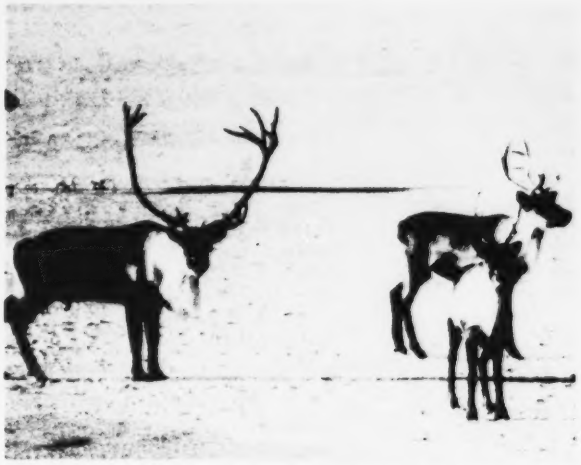
Government of the NWT and native organizations (a similar agreement is being developed for the Yukon, between the federal and territorial government, with the full consultation of the Council for Yukon Indians). The land use planning agreements between the federal and territorial governments state that "the plans will provide for conservation, development, and utilization of land resources, inland waters and the offshore". A major element of land use planning will be local consultation and the reflection of local needs in the planning process.

Comprehensive native land claim agreements are also recognized by the Task Force on Northern Conservation as a way of promoting conservation. The Western Arctic Claims Agreement (Inuvialuit Final Agreement), concluded in 1984, provides for a national park in the northern Yukon, a territorial park on Herschel Island, a native voice in all decisions respecting wildlife use, land management and economic development on native lands, an environmental impact assessment and review process. Other comprehensive claims currently under negotiation will include conservation provisions. By giving increased responsibility for northern conservation to native peoples, the agreements ensure that they have greater control over their future.

3) **Progress has been made on a network of protected areas aimed at preserving species and their habitats, and unique and representative ecosystems. Other areas of national or international importance are also officially recognized.**

Fifteen terrestrial parks and three marine parks are required to represent the North's natural regions as defined by DOE. To-date, there are five terrestrial national parks or park reserves (Wood Buffalo and North Yukon National Parks, and Kluane, Nahanni and Auyuittuq national park reserves). Another three areas have been set aside by Order in Council for national parks. Areas must be set aside for the remaining seven terrestrial and three marine parks (feasibility studies are underway for a marine park in the Lancaster Sound area). The WCS has designated the biogeographical province which includes the arctic desert, the Arctic Archipelago and the Canadian arctic tundra as a priority for preservation. Two areas being considered for national park status (northern Banks Island and Bylot Island-Eclipse Sound) would meet this priority.

A territorial park system in the Yukon is under development. Lands have been selected for two territorial parks at Coal River Springs and Herschel Island.



Canada's North holds a major proportion of the world's population of Caribou.
Government of the Northwest Territories.

The Canadian Landmarks Programme protects unique, rare and exceptional natural features. A landmark established in 1985 protects pingos in the Mackenzie Delta region. A second landmark is proposed for the Nelson Head area of Banks Island, which includes spectacular sea cliffs. Potential landmarks have also been identified for the eastern Arctic.

The Alsek River (Kluane National Park Reserve) and the South Nahanni River (Nahanni National Park Reserve) are designated as Heritage Rivers under the Canadian Heritage Rivers System, established in 1984 to give national recognition to the important rivers of Canada and to ensure long-term management to conserve their natural, historical and recreational values. The 30 Mile Section of the Yukon River is being proposed for Heritage River Status and work is underway on this proposal.

DOE has set up 16 migratory bird sanctuaries, where hunting and the taking of eggs are prohibited. One national wildlife area, designated to preserve or increase an area's value to wildlife, is awaiting formal proclamation. The Yukon Territorial Government and DOE have recently completed a wood bison transplant in the Territory.

The NWT and federal governments have entered into a "Memorandum of Understanding on a Cooperative Planning and Public Consultation Process for Wildlife Conservation Areas". The agreement aims (1) to maintain and enhance wildlife and migratory bird populations by protecting their important habitats and (2) to improve cooperation between departments and consultation with the public in this area.

DOE's Northern Conservation Lands Inventory (1980-81) provides a federal perspective on northern areas having natural and cultural values of Canadian significance (*Canada's Special Places in the North: an Environment Canada Perspective for the 80s*). The same department's *Key Migratory Bird Terrestrial Habitat Sites in the Northwest Territories* (1984) identifies sites in the NWT which are essential to the welfare of migratory bird species. Both of these inventories provide conservation guidance to other agencies with interests in the NWT. Essential marine habitat sites for migratory birds are still being identified.

4) **Wildlife species and habitats are further protected by programmes aimed at preserving genetic diversity and sustainable use.**

The Committee on the Status of Endangered Wildlife in Canada has officially declared five northern species "endangered" (bowhead whale, wood bison, Eskimo Curlew, Peregrine Falcon *anatum*, and Whooping Crane), three others "threatened" (North Pacific Whale, Peary caribou, and Peregrine Falcon *tundrius*), and four others "rare" (Ivory Gull, Ross's Gull, Great Gray Owl and Trumpeter Swan). DOE is protecting gene pools of some northern species through captive breeding and rearing and rehabilitation of species in the wild. Research continues into population levels of northern species at risk and factors causing their decline.

The Porcupine Caribou Management Agreement, signed by the federal and territorial governments and four native organizations in 1985, established a joint management board to coordinate hunting levels, research and habitat protection. The governments of the Yukon and Alaska are currently negotiating an international convention to conserve the Porcupine herd and its habitat.

5) **Provisions have been made to ensure that conservation objectives are considered when development is planned and when it occurs.**

Under the Environmental Assessment and Review Process (EARP), federal departments screen proposed projects for possible adverse effects. A project with possible significant effects is referred to the Federal Environmental Assessment Review Office for a formal review. An independent panel then evaluates environmental and related consequences, primarily through public hearings, before making recommendations to the government. In the North, EARP panels have investigated the Norman Wells pipeline and hydrocarbon development in both Lancaster Sound and the Beaufort Sea.

Interdepartmental committees have been established to advise on development and related government activities. Those that have particular responsibilities for northern Canada include the Interdepartmental Environmental Review Committee, the Resource Management Environmental Committee, the Arctic Waters Advisory Committee, the Environmental Advisory Committee on Arctic Marine Transport and the Advisory Group on Sensitive Areas North of 60°.

In support of its responsibilities to advise on development-related activities in the North, DFO has developed a classification scheme based on the importance of an area to fish and marine mammal stocks, on the harvest of these resources, on threats to the environment and on the adequacy of the biological and oceanographic data base. Similarly, DOE has begun to designate preferred ocean dumpsites in the Beaufort Sea and in the eastern Arctic, in preparation for permit applications and in an effort to minimize potential environmental disruptions.

6) **A considerable amount of research has been undertaken on northern ecosystems, on the effects of human activities on these ecosystems, and on ways to mitigate damage to the environment – all of which are of crucial importance to achieve conservation objectives.**

Although major surveys have been taken in the North only recently, its natural resources have been extensively studied, especially by DOE, Energy, Mines and Resources Canada (EMR) and National Museums of Canada. The Northern Land Use Information Series (DOE and DINA) presents information on fisheries, wildlife, recreation, forestry, agriculture, ecological land units, cultural profiles and historical sites over most of the North. Agriculture Canada has information on northern soils and EMR has information on bedrock and surface geology.

Much valuable information has been generated by government and industry to aid in environmental impact assessments. Recently, under EARP, industry produced an extensive report, *Hydrocarbon Development in the Beaufort Sea – Mackenzie Delta Region*, which details conservation concerns and development pressures. In 1980, scientists from various government departments, in cooperation with industry and local communities, completed the Eastern Arctic Marine Environmental Studies Programme, which greatly expanded knowledge of the marine environment of the eastern Arctic.

Several programmes established to prepare federal and territorial governments for hydrocarbon development in the North have also generated research. Such programmes include the Arctic Marine Oil Spill

An extensive network of glaciers radiate from the icefields in Kluane National Park, Yukon.
Parks Canada.

Programme, which supports technology development for oil spill countermeasures in arctic waters; the Northern Environmental Studies Revolving Fund, which focuses on environmental and socio-economic aspects of northern oil and gas extraction; and the Northern Oil and Gas Action Programme, which ensures that the federal and territorial governments have the information and expertise to manage commercial production of oil and gas in Canada's North.

Non-government organizations have contributed substantially to conservation. Since 1980, World Wildlife Fund Canada has allocated approximately $1 million to conservation projects in the Arctic, and is currently funding cooperative research to identify the most critical conservation needs of narwhals, belugas and bowhead whales. The Canadian Arctic Resources Committee is producing a series of publications dealing with how northern conservation policies can be reconciled with northern political development and national and regional economic security.

Conclusion

Although ideas proposed in the WCS, and subsequently in the Task Force on Northern Conservation, have been widely embraced, a commitment to action is also necessary to achieve conservation objectives. Protected areas, for instance, require a considerable investment of resources by government agencies. So, too, does replacement of an *ad hoc* programme of environmental protection and preservation with a proactive approach which addresses broader conservation needs. Conservation in the North requires political will and public support of conservation-based economic development. In particular, it requires concerted regional strategies instead of disjointed sectoral approaches.

The future for northern conservation is promising. A primary factor is the emerging acceptance of the need for cooperation among government and non-government parties. The *Report of the Task Force on Northern Conservation* and the ongoing implementation of its recommendations, exemplify this consensus-building

approach. Not only does the report demonstrate the potential for a constructive consensus among a spectrum of interests, it provides a framework for continued cooperation.

The Northern Land Use Planning Program and native land claims settlements should be in place in the near future, providing the necessary vehicles to advance conservation objectives. Although these two mechanisms remain unresolved and may appear to present a temporary obstacle to progress in conservation, they also promise a significant advance in northern resource management.

Wetlands

Introduction

Wetlands are a major component of Canada's conservation strategy and must be considered in association with both land and water conservation efforts. Wetlands, including bog, fen, marsh, swamp and shallow water, cover over 14% of Canada's surface area. They contain various resources and are exploited and administered by a surprisingly large number of otherwise disparate interests.

Wetland Values

Wetlands are critical for maintaining various **essential ecological processes and life-support systems**. Primary productivity can be very high in some wetlands, and they provide critical habitats for a diversity of wildlife, particularly for numerous waterfowl. Wetlands are also used by raptors, shorebirds, songbirds, several mammals and fish species.

Coastal estuaries are important for various species of seals, whales, fish and invertebrates.

Hydrologically, wetlands moderate flood peaks and storm flows. They provide permanent and seasonal "sinks" for acid rain and airborne heavy metals. They also help to purify water, trap pesticides, and some have been studied and developed as sites for wastewater treatment systems for rural communities. They also help to control erosion, particularly next to large water bodies, by binding shore substrates, dissipating wave energy, currents, and tides, and reducing damage to shore properties.

Wetlands support **genetic diversity**. They are key habitats for over 45 species of waterfowl, 155 other bird species, 50 mammals and extensive flora. Wetlands also provide habitat for about one third of the wildlife species which have been identified as endangered, threatened or rare by the Committee on the Status of Endangered Wildlife in Canada.

In terms of **sustainable utilization** of wetlands for Canada's economy, native and sport fishing and hunting, recreation and appreciation, and natural resources harvesting contribute billions of dollars annually. Eight large wild rice processing plants and many small ones also annually generate several million dollars. In Quebec, New Brunswick, Manitoba and British Columbia, peat harvesting (for horticulture and limited energy production), generated sales of almost $50 million in 1983.

Wetland Conservation Achievements

A national system of classification of wetlands has been researched, developed, and applied by the Wetland Working Group of the Canada Committee on Ecological Land Classification. The working group has also produced national maps showing the ecology and distribution of wetlands in Canada by wetland regions, with a companion reference book on *The Wetlands of Canada* to be published in late 1986.

Inventories make it possible for resource managers to assess and monitor changes in wetlands and to develop strategies and policies. In Atlantic Canada, DOE and provincial agencies have developed and implemented the Wetland Protection Mapping and Designation Programme, covering all New Brunswick, Nova Scotia and Prince Edward Island. Newfoundland and Labrador have also been surveyed. Quebec has studied and mapped many wetlands. Ecological land surveys carried out by various agencies provide an extensive terrestrial, aquatic and wetland data base for about half of the province. Wetlands along the St. Lawrence River have also been inventoried and recent efforts are directed towards developing an information base on peatlands. In Ontario, the Peat Resources Inventory Programme studied and mapped over 416 peatland sites, and other wetlands have been inventoried and mapped in southern Ontario. The need for wetland inventories has been particularly acute in the Prairie Provinces. DOE and the US Fish and Wildlife Service annually inventory the southern prairies to assess waterfowl habitat and production status. Ducks Unlimited, a private non-profit conservation agency, has been instrumental in securing or rehabilitating over 1.4 million ha of wetlands across Canada. In 1981, it established the Wetland Habitat Inventory Project, which will map all wetland sites over 2 ha in an area of 780 000 km^2, mainly in Canada. In 1985, Ducks Unlimited commenced analysis using LANDSAT digital high resolution data.

Regional peatland and ecological land surveys including the Northern Resources Information Program and specific soil and surficial geology surveys (Manitoba), the Wetland Habitat Inventory of selected areas and soil surveys (Saskatchewan), and regional ecological land surveys (Alberta) have yielded information about wetlands. In British Columbia, provincial and federal agen-

Wetlands in Wood Buffalo National Park are breeding grounds for Whooping Cranes.
Canadian Wildlife Service, Environment Canada.

cies have inventoried over 100 coastal estuaries and the interior wetlands. Extensive ecological and soil surveys have provided coverage in other areas. In the North, DOE compiled data on wetlands in a major study of the Beaufort Sea and Northwest Passage regions. Peat resources in the Mackenzie Valley have also been surveyed, and wetlands have been mapped in detail in some areas.

Wetland evaluation programmes help managers to weigh ecological, socio-economic and developmental factors in an integrated fashion. In the Atlantic provinces, DOE's Wetland Protection Mapping and Designation Programme is evaluating wetlands for habitat diversity and importance to wildlife; this programme will be used to develop protective measures. The Ontario government and DOE have evaluated over 1200 wetlands in that province according to their biological, social and hydrological values and special features; results of evaluations to date suggest that 13% of wetlands in southern Ontario are provincially significant. In British Columbia, the provincial government and DOE are developing a system to evaluate coastal wetlands for waterfowl, wildlife and fish resources, productivity, social values, imminence of development, and rehabilitation and enhancement values; the province is also developing an Estuary Habitat Mapping and Classification System and has published a draft *Wetland Manager's Manual* for the Cariboo Resource Management Region. Nationally, DOE is testing a new rating system for wetlands important to migratory birds.

At least 25 wetland monitoring projects across Canada provide conservationists with essential data on wetland trends. The Canada Land Use Monitoring Programme of DOE has documented land use changes on wetlands across Canada, and has developed a series of case studies of highly impacted, prime wetland areas. The programme has published studies of wetland losses in the Fraser Valley, in southern Ontario, along the St.

Lawrence and for areas surrounding Canada's 23 largest metropolitan areas. The programme will establish a sampling network across the prairies to monitor wetland changes and to evaluate the impact of conservation initiatives. Each year, DOE and the US Fish and Wildlife Service monitor waterfowl habitat through an extensive series of fixed transects across the southern prairies. Ducks Unlimited Canada has surveyed change in numerous prairie watersheds. DOE recorded detailed changes in the extent of wetlands in southern Ontario over the years 1800-1965 and 1965-83.

Other policy and management initiatives that recognize the need to protect wetland ecosystems have recently been achieved:

The draft North American Waterfowl Management Plan is an ambitious plan to conserve continental waterfowl populations and their wetland habitats from 1986 until 2000. It was proposed in November 1985 by DOE and the US Fish and Wildlife Service. The plan is to protect or improve wetlands in the prairies, Great Lakes – St. Lawrence region and Atlantic region. Wetlands will also be inventoried and monitored by all levels of government. Specific waterfowl harvest, population management, subsistence and research strategies are proposed.

The Wildlife Habitat Canada Foundation was established in 1984 as a private non-profit organization to preserve all types of wildlife habitat. Grants from DOE and annual revenue from Migratory Game Bird Hunting Permit Stamps allow the foundation to provide expertise, planning and coordination to agencies working for wetland conservation along with research and acquisition of wetlands.

Acquisition of wetland sites and creation of national migratory bird sanctuaries and national wildlife areas by DOE has been a financially limited but successful mechanism for protection of many key wetlands across Canada. Federal, provincial and territorial governments have established ecological reserves, game sanctuaries and parks, often to preserve unique wetland sites (e.g. Point Pelee and Wood Buffalo National Parks).

In Ontario, a discussion paper on wetland policy issued in 1981 culminated in the 1984 *Guidelines for Wetland Management in Ontario*, which sets out immediate and long-term needs for wetland protection for use by municipal land use planners. The Ontario Wetland Evaluation and Peat Inventory Programmes provide wetland data to provincial land management agencies. The Federation of Ontario Naturalists, in 1984, circulated a discussion paper on a wetland strategy for Ontario promoting public appreciation, amendments to existing legislation and new legislation.

Outlook for Wetland Conservation in Canada

Recent developments augur well for wetland conservation in Canada. The 1984 establishment of the Wildlife Habitat Canada Foundation, the proposed North American Waterfowl Management Plan, and Ontario's adoption of policies for wetland management are promising conservation efforts. A national fact sheet by DOE on wetland conversions will provide up-to-date statistics on wetland losses. Wetlands will only be conserved through coordinated federal, provincial, territorial and non-governmental conservation actions.

Percé Rock, Gaspé, Québec.
Canadian Wildlife Service, Environment Canada.

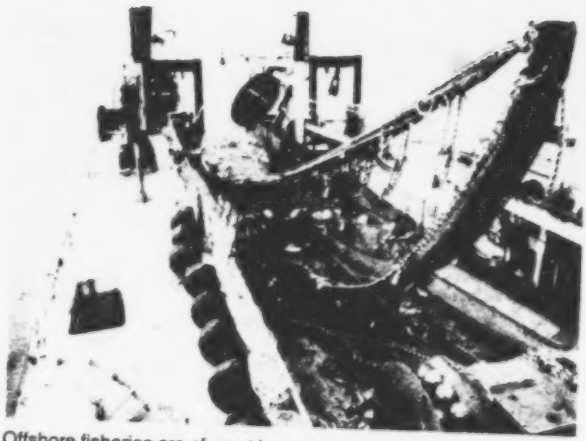
PRIORITY INTERNATIONAL ACTIONS

3a Review of the coverage and effectiveness of international law relevant to living resources and development of new law to remedy any deficiencies

In the last decade, Canada has helped to strengthen international law relevant to living resources through new definitions of the territorial boundaries within which Canadian legislation applies, and through the review and development of bilateral and multilateral arrangements.

Following the UN Conference on the Law of the Sea, Canada extended its fishing zone to 200 miles from shore in 1976-77, thus strengthening its ability to manage international fisheries quotas for sustainable use, and extending the application of laws to control marine pollution. The International Court of Justice recently clarified the resulting location of the Canada-US boundary over the important Georges Bank fishing grounds. Further north on the east coast, Canada and Denmark (Greenland) signed an agreement on Marine Environmental Cooperation in 1983. Canada helped to develop the UN Convention on Law of the Sea, signed in 1982; if adopted internationally, this law will provide an important tool for conservation of the marine environment and its resources. In 1985, a UNEP Working Group completed the "Montreal Guidelines for the Protection of the Marine Environment Against Marine Pollution from Land Based Sources" at a session hosted by Canada. If adopted, these will be the first measures to deal with such pollution on an international basis.

The need for improvements in international law has been identified and is being worked on in several specific areas. Reciprocal access by Canadians to sue in US courts and vice versa was recommended to each province and state in 1982 by the American and Canadian Uniform Law Conference through a proposed Uniform Transboundary Pollution Reciprocal Access Act; this would allow action on pollution which is generated in one country, but has effects in the other. In 1986 Ontario passed a Transboundary Pollution Reciprocal Access Act. Progress towards an effective Canada-US agreement to control acid rain continues to be slow.



Offshore fisheries are of great importance to the Canadian economy. M. Thérien, Department of Fisheries and Oceans.

Canada and the US are cooperating to develop an international agreement on management of the international Porcupine caribou herd, which provides subsistence to people in both countries. Both countries are also working on a protocol to the Migratory Birds Convention to allow for a regulated spring hunt for subsistence, a need which was not taken into account when the convention was signed in 1916.

Many other reviews could be cited. For the most part, international law regarding living resources is reviewed and proposals for change are made in each natural resource sector, as the needs become evident to the management agencies.

3b Implementation of international conservation conventions

Three ocean coasts and a continent-wide border with the US have led Canada to develop many conservation

Waterton Lakes National Park, Alberta, is one of only two Biosphere Reserves in Canada.
George Hunter, S.S.C. Photo Centre A.S.C.

agreements with other countries. Some of the more important involvements are described here, including four conventions emphasized in the WCS.

Canada acceeded to the Ramsar Convention on Wetlands of International Importance in 1981, and has so far listed 17 sites. The fourth meeting of the parties to the convention will be in Regina, Saskatchewan in 1987 to review progress in wetlands conservation. Canada has also contributed to a 2-year effort, to list and evaluate major wetlands in Latin America, a programme coordinated by the International Waterfowl Research Bureau.

As a signatory to the 1975 Convention on International Trade in Endangered Species of Flora and Fauna (CITES), Canada regulates the importation from other countries of wildlife species which are designated in the CITES appendices. In turn, other member countries regulate their trade in over 150 Canadian species which are listed on the appendices as requiring special conservation. Canada has insisted that the listing of species should be based on scientific knowledge of their populations. Canada will host the Sixth Biennial CITES meeting in Ottawa, July 1987. Individual Canadians and governments in Canada have also provided funding and expertise to help protect endangered species in other countries, including notably the Galapagos Islands fauna, giant pandas, and certain raptors that winter in Latin America.

Canada acceded to the World Heritage Convention in 1976, and since then has contributed to the World Heritage Fund, and listed four cultural sites (L'Anse aux Meadows, Anthony Island, Head-Smashed-In Buffalo Jump, and the historic district of Quebec) and five natural sites (Dinosaur Provincial Park, Canadian Rocky Mountain Parks, Nahanni National Park, Wood Buffalo National Park, and with the US, Kluane/Wrangell – St. Elias National Parks). Canada also participates in the Unesco Man and the Biosphere Programme, although only two biosphere reserves (Mount St.-Hilaire, Quebec, and Waterton Lakes National Park, Alberta) have been designated in Canada, out of over 150 reserves established in 40 countries.

Canada is not a signatory to the Bonn Convention on Conservation of Migratory Species of Wild Animals, but is party to several conventions which cover migratory animals whose ranges are shared with other countries. Under the Migratory Birds Convention (1916), Canada and the US cooperate to protect and manage the utilization of birds shared by the two countries, including waterfowl, shorebirds, songbirds and seabirds. Each country monitors changes in populations of hunted species through hunter questionnaires and surveys of nesting grounds; regulations are set cooperatively. Coordinated bird banding programmes aid in understanding non-game bird populations. A draft North American Waterfowl Plan with explicit population and habitat goals for these species is under discussion in both countries.

The Agreement on the Conservation of Polar Bears (1976) between Canada, Denmark, Norway, the US and the USSR, covers research coordination, restrictions on kill and capture, and protection of polar bears' ecosystems. Canada accounts for about 75% of all polar bears taken annually, mostly through quotas for native people, and has contributed research on population dynamics, denning areas, bear-human interactions, and the effects of industrial activity. Polar Bear Provincial Park in Ontario protects important denning areas.

Several conventions have been established to conserve living marine resources. Canada's participation and achievements through these conventions are examined in *3h* and *3n*.

Numerous bilateral agreements have been developed to share information and other services for forest conservation. Several provinces have agreements with bordering states of the US. Joint councils address cooperative pest management; and a 1977 memorandum of understanding set up a joint Canada-US research programme on spruce budworm. Canada also has forestry exchange agreements with the USSR, the People's Republic of China, Japan and Mexico.

To improve environmental quality, Canada is party to many other bilateral and multilateral agreements, including the Great Lakes Water Quality Agreement with the US (1978), the Convention on Long Range Transboundary Air Pollution (since 1981) under which members have agreed to reduce SO_2 emissions, the Vienna Convention for Protection of the Ozone Layer (1985), and a variety of agreements on marine environmental quality, particularly relating to accidental and intentional spills and dumping.

3c Multilateral and bilateral assistance for reforestation, the restoration of degraded environments, and the protection of the support systems of fisheries and of genetic resources

This section describes Canada's assistance in the development of fishery resources; forestry and degraded environments of drylands are addressed in *3e* and *3f*, respectively.

Fish stocks around the world offer great potential as renewable resources for social and economic development of poorer nations. However, fishery development presents special problems, arising from the hidden and mobile nature of the resource, the consequential uncertainty of exploitation, the different responses of fish species to pressures, and lack of enforceable regulation or management.

Canada has signed an agreement on the Conservation of Polar Bears. Environment Canada.

Fisheries development represents a major avenue for Canadian bilateral assistance, and is undertaken comprehensively, from resource inventory to marketing. Currently, the Canadian International Development Agency (CIDA) supports 30 fishery projects in Asia, anglophone and francophone Africas, South America, and Caribbean and Central Americas; fisheries are included in a further six cross-sectoral projects. High priority is given to small-scale or inshore fisheries, with emphasis on resource management. Rational exploitation of the resource may be supported with ports and port facilities, fishing materials, engines and hardware for boat-building. Consolidation of fish-processing plants, improved use of the catch and marketing are supported. Once trained, nationals are expected to assume responsibility for operating and managing fisheries and supporting operations.

A country with significant fisheries of its own, Canada has provided expertise both in specific operations and in training. DFO and EMR have provided scientists and the research vessel "Baffin" to study the Peruvian anchovy, and its sustainable utilization. Hydrographic surveys of the coastlines and continental shelf of Senegal and Gambia have also been conducted with the "Baffin". West Africa, the West Indies and southeast Asia have received help with large-scale stock surveys, and fisheries protection and surveillance techniques. Senegal fishermen have received 3500 outboard motors, together with mechanics training, to mechanize operations. Guinea, Cameroon and Ghana have also received support.

Significant developments in aquaculture have occurred in Brazil with the study of the biology of indigenous species at a station originally funded by the Food and Agriculture Organization of the UN. A similar station is

being supported in Sri Lanka. These stations conduct adaptive research into seeds, feeds, diseases and parasites, provide training and extension, and produce fry for stocking. Fish farming is also being developed in Thailand, Philippines and Malaysia. Particularly noteworthy is the National Inland Fisheries Institute in Bangkok, created under the supervision of the Freshwater Institute, Winnipeg. The institute is in the process of establishing a network of smaller stations throughout Thailand. Nationals have been trained to take full responsibility for the institute through programmes at the University of Manitoba. Dalhousie University, Halifax, and Memorial University, St. John's, have also been involved in training fisheries staff for CIDA projects.

In 1985, the International Centre for Ocean Development was established as a Crown corporation in Halifax, Nova Scotia to cooperate with and assist developing countries in use and management of ocean resources, with particular emphasis on policies favouring integrated ocean management.

All research in support of fishery development is conducted by the International Development Research Centre (IDRC). Considerable emphasis has been placed on aquaculture, and on primary factors of a farmers' aquaculture operation – seed, feed, genetic improvement and disease control. A major milkfish project at the Southeast Asia Fisheries Development Centre has been supported. IDRC workshops and other activities are looking to aquaculture projects in many parts of southeast Asia (notably the ASEAN[1] group of countries), Egypt, Central and South America, and Africa.

3d Multilateral and bilateral assistance for the design and implementation of ecologically appropriate policies and the establishment and maintenance of effective conservation procedures, laws and organizations

As a guiding principle, Canadian development assistance programmes incorporate provisions to encourage self-reliance among nations receiving aid. Most bilateral projects discussed in *3c*, *3e* and *3f* include development of policies and management strategies for sustained use of natural resources; certain projects are primarily concerned with this task.

The natural resources division of the Canadian International Development Agency is examining whether its own policies and programmes are effective in encouraging self-sufficiency of national infrastructures concerned with conservation. The periodic reviews of projects provide opportunities for assessing effectiveness at specific levels.

[1] Association of South East Asian Nations.

3e Cooperative programmes for conservation of tropical forests

Tropical forests are one of the most important, and the most threatened, life-support systems on the planet. Tropical forests play integral roles in soil conservation and hydrologic cycles over vast areas, contain a major portion of the world's heritage of genetic diversity, and represent a substantial reservoir of carbon that if mismanaged could lead to further increases in atmospheric carbon dioxide. They can also play significant roles in sustained economic development in the Third World. Despite these critical functions, forests in most countries of the humid and dry tropics are being devastated at an alarming rate. At the same time, national and international support for tropical forestry has been declining.

Canada has been very active in taking remedial measures, principally through the Canadian International Development Agency (CIDA) and also through the International Development Research Centre (IDRC). Since 1968, CIDA has allocated about $500 million for bilateral forestry development projects in 60 countries. In 1974-84, 107 projects were funded in forestry and forest industries: 35 of these were located in Asia, 34 in Caribbean and Latin American countries and 38 in Africa. Canada's contribution is currently about $45 million, or 20% of the total aid from bilateral donors. Programmes supported by CIDA include forest management, conservation and utilization, and project activities include inventory, planning, training, reforestation, harvesting and utilization.

Forest development projects in the Third World face shortcomings in institutions, infrastructures, technologies, sizes of industries and numbers of skilled workers. Initially, the traditional roles of forests in meeting domestic and subsistence needs tended to be disregarded. However, these views have been revised; a review of all CIDA forestry projects is in progress; and a strategy for forestry development to the year 2000 has been drafted, which addresses five objectives:

- to increase sustainable production from forest resources in the Third World,
- to use forest products more efficiently,
- to conserve the natural resource heritage of the world's poorest regions,
- to assure distribution of local and industrial outputs to the poorest segments of developing societies, and
- to enhance contacts between the forestry sectors of Canada and the Third World for mutual benefit.

Attention has been paid to the region represented by the Association of South East Asian Nations (ASEAN), where valuable concentrations of tropical hardwoods occur. Protection of remaining forests and accelerated

CIDA Forestry Research in St. Lucia.
Canadian International Development Agency.

planting programmes are urgently needed. CIDA is providing significant support in two projects. An ASEAN Tree Seed Centre was established in 1981-84, and will continue to receive support through 1989. An ASEAN Forest Management Institute will address forest inventory, mensuration and management problems of the region.

The IDRC supports research for sustained development. In 1984-85, it funded 90 projects, totalling $22 million, in the agriculture, food and nutrition sciences, including forestry. It has contributed recently to applied research in bamboo and rattan, through a research network that includes 10 projects in seven Asian countries. Other research topics include management of fuelwood plantations, arid zone and high elevation afforestation, agroforestry, indigenous tree resources, remote sensing, training (including a special programme to train research managers) and policy development.

Canada has assisted in a recent initiative by the International Union of Forest Research Organizations to conduct special workshops on increasing productivity of multipurpose species. The first workshop, focusing on Asian species, was held in Sri Lanka in 1984; the second, on African species, was held in Kenya in 1986. A third workshop will be held in Peru in 1987, where species of Latin America will be discussed.

In a new initiative for the enhancement of tropical forestry, the World Resources Institute (WRI), in cooperation with The World Bank, the United Nations Development Programme and bilateral aid agencies, including CIDA, has published *Tropical Forests: A Call for Action* [1]. A nine-member task force, in which Canada participated, focused on adapting existing practices and strategies to prepare a 5-year (1987-91) plan on which to base future investments in tropical forestry. The plan addresses the five strategic priorities of the UN Food and Agriculture Organization (FAO), whose Committee on Forest Development in the Tropics has prepared a detailed report entitled *Tropical Forestry Action Plan* [2]. Fuelwood

[1] World Resources Institute, 1985, *Tropical forests: a call for action*, World Resources Institute, 1735 New York Avenue, N.W., Washington, DC 20006.

[2] FAO, 1985, *Tropical forestry action plan*, Committee on Forest Development in the Tropics, Food and Agriculture Organization of the United Nations, Rome, Italy.

and agroforestry, land use on upland watersheds, forest management for industrial uses, conservation of tropical forest ecosystems, and strengthening institutions for research, training and extension, constitute the five FAO priorities. In essence, the WRI plan calls for a doubling of global aid for tropical forestry to implement the priority actions. The FAO and WRI initiatives provide a sound basis for the coordination of international effort and aid in tropical forestry, and hold considerable promise for the future.

3f Cooperative programmes for conservation of drylands

Drylands occupy about a third of the earth's land surface, and are extremely prone to turn into deserts if they are misused. Although drylands occur in all continents, the heaviest concentrations are in Africa, where all lands surrounding the vast hyperarid zone are at either high or very high risk of desertification. It is into this area, and the 2.5 million km^2 Sahel in particular, that much Canadian conservation effort is directed. Canada's bilateral assistance to countries of the Sahel is provided through the Canadian International Development Agency (CIDA). In establishing priorities for aid, CIDA's policy is to assist the poorest and most neglected groups, The emphasis is therefore on rural populations and on strengthening rural economies to establish a new socio-ecological balance in the Sahel.

The Canadian programme is aimed at improved working conditions, increased production and a higher standard of living in rural communities of the Sahel, and relies heavily on active involvement of the local people. CIDA financially supports and controls the Sahel project, working cooperatively with Canadian institutions that are responsible for research and implementation. Canada's long experience in dealing with drought-prone agricultural land of the prairies has proved to be a valuable asset in developing its programmes in the semi-arid areas of the world. Canada's soil and water management practices, such as contouring, terracing and mulching, zero tillage, coupled with a long history of crop testing, agronomy, other relevant research and technology, provide a solid base from which conservation measures may be developed for arid lands.

In the Sahel three priorities set the themes for programme development: stabilization of vegetative cover, self-sufficiency in food and balanced nutrition, and enhanced use of local energy sources. Projects undertaken may include reforestation and forest protection, dune stabilization, improved animal husbandry, transfer of agricultural technology, cereal storage, conservative harvesting, orchards, marketing, wood-based energy substitutes, and appropriate applications of solar and electrical energy. In addition, the programme provides for supporting activities such as development of water resources, human resources, and transportation infrastructure.

Canadian institutions (such as universities, Agriculture Canada, the International Development Research Centre and private firms) and the international agricultural research centres execute the necessary supporting research and oversee implementation of agricultural programmes, in cooperation with CIDA. The research is of necessity long term, requiring many years for the operational application of innovations.

In the example of Canadian assistance to the Sahel, bilateral aid is directed mainly at Mali, Burkina Faso, and Niger, three of the world's poorest nations. A major programme valued at about $100 million is planned for 1986-91. Senegal will receive CIDA support to combat desertification in the north of the country. Again, emphasis will be laid on work through local people.

Canada also supports conservation activities through multilateral aid. For example the International Crops Research Institute for the Semi-Arid Tropics currently receives $1.65 million annually from CIDA, and has developed a centre in the Sahel for conducting research into farming systems.

Canada's official development-assistance funding amounted to $2100.6 million in 1984-85, of which $390.89 million was provided to African countries through bilateral assistance. Much of Canada's development aid is directed to countries with arid or semi-arid conditions; the Sahelian task described is just one, albeit a large one, of many undertaken throughout the world. Such countries as India, Pakistan, Sudan and Tanzania are currently involved in projects of research into and support of dryland farming technology. Enormous difficulties remain, not only in restoring arid lands to their resource potential, but also in confronting people with the change in life-style necessary to bring about these restorations. Two cents of every dollar spent by the federal government goes into development programmes. But the results are measurable and significant. All countries in the Sahel have experienced increases in life expectancy, infant survival, adult literacy, and enrolment of young females in school in the past 20 years. Such changes indicate real progress in improving the livelihoods of rural people, in spite of great obstacles in countries beset with arid lands.

3g A cooperative programme for the on site protection of the wild relatives of economic or useful species, of threatened species, and of ecosystems of exceptional diversity

Several sectoral strategies to safeguard useful genetic resources on site have been developed in

Canada (see *1h*). As a general principle, however, such strategies are inefficient in a global sense, because of the practical limits to establishing protected areas. The WCS calls for a more cooperative approach to such conservation through the identification and designation of areas of concentrated genetic resources having global significance.

Concentrations of wild relatives of useful species are a prime concern, priority sites for many plant species are determined by crop importance, established by the International Board for Plant Genetic Resources. Although Canada has no major endemic crop species, we have supported the board and participated in activities designed to protect the geographic origins of some of our domestic crops. Global priorities for forest tree species are set by the FAO Panel of Experts on Forest Genetic Resources, to which Canada reports. To date, the panel has identified 130 priority species, most of which occur in six regions. One of these regions lies in the eastern US and Canada.

Concentrations of threatened species are also a high priority. Most threatened species of plant and vertebrate animals are in tropical ecosystems. However, losses through habitat destruction in wetlands and freshwaters of North America constitute a specific concern; Canadian actions are described under sections *1d* and *1e*, and under Wetlands.

Ecosystems of exceptional diversity clearly indicate important concentrations. Again, most priorities lie in the tropics. However, the Pacific northeast has been identified as a marine area of exceptional diversity; the region has experienced prolonged conflicts over development proposals. Several critical sites have been protected through provincially legislated ecological areas and marine parks by the province of British Columbia (see *1i*); numerous national and regional policies affecting coastal, estuarine and freshwater resources safeguard much of the area, but a comprehensive strategy is lacking.

The WCS notes that many globally important biogeographical regions or "provinces" are inadequately represented by national parks. Critical gaps in the global network of biosphere reserves occur in six ecosystem groups including tundra and barren arctic deserts, and river and lake systems. Canada has by far the largest representatives of both. There are no immediate prospects for biosphere reserves in either of these high priority or priority biogeographic provinces. However, considerable progress is being made to conserve northern resources (see the North), and the Great Lakes and associated rivers are subject to numerous measures designed to protect their ecosystems (see *1d, 1f, 3m*).

Important related international activities include the development and implementation of Plant Breeders' Rights. Canadian legislation to support such rights, and to standardize varietal identity is in preparation. A protracted period of consultation should ensure that exchange of genetic material and available genetic diversity within species are not compromised. The Plant Quarantine Act protects useful plant species from uncontrolled importation of infected materials.

Finally, the WCS calls for more active participation by industry in the support and development of on site protection of genetic resources. The Canadian forest industry has been involved in protecting several important forest sites, primarily with direct sectoral interests. Companies occupying important sites have cooperated in exchange for resource lands of comparable commercial value. However, it is probably true to say that the concept of support for protected sites as long-term genetic banks is not widely established in Canada.

3h Conservation of the species and ecosystems of the open ocean

Because they are beyond the direct control of interested nations, species and ecosystems of the open sea are particularly vulnerable to over-utilization and mismanagement. Strategies for conservation of species have evolved through numerous conventions and commissions, dating back to the Fur Seal Treaty of 1911 between Canada, the US and Japan. In 1923, the International Pacific Halibut Commission was established to provide a data base for the regulation of this important species of the North Pacific and Bering Sea continental shelf.

Salmon have supported major commercial enterprises on the west coast. Despite the immensity of the Pacific Ocean, salmon fisheries have nevertheless experienced extreme pressure from overfishing, and have suffered from loss of freshwater habitat. The need for conservation of salmon was recognized jointly through the International Pacific Salmon Fisheries Commission of 1930, later amended to include pink salmon, in 1956.

Canada has always maintained the position that high seas fishing for anadromous salmonids is incompatible with the rational management of the resource although an exception was made for the Japanese salmon fisheries in our negotiations for the Law of the Sea.

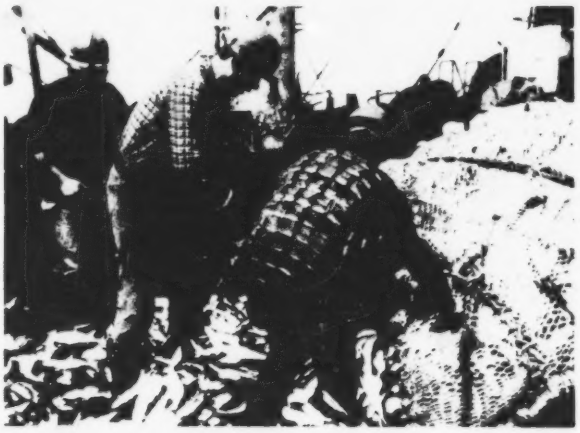
The high-seas fisheries conducted by Japan are, in part, controlled by the International Convention for the High Seas Fisheries of the North Pacific Ocean, between Canada, Japan and the US, (1953). The International North Pacific Fisheries Commission was established to carry out the terms of the convention; an intensive programme of research was undertaken by the three

member countries to determine the ocean distribution and migration routes of salmon originating in North America and Asia and to determine whether a provisional line at 175°W protected North American salmon from harvest. Early results indicated that substantial quantities of North American salmon, essentially of Alaskan origin, migrated west of 175°W and were being taken in the Japanese high-seas mothership fishery. In 1978, the convention was renegotiated, and the eastern limit of Japanese high-seas salmon fishing was reset. Again, the convention called for recommendations concerning modification of the Japanese fishing areas.

In 1977, federal and provincial governments initiated the Salmonid Enhancement Programme aimed at doubling production of anadromous salmon and trout; expenditures to date should achieve a 25% increase in production by the year 2000.

A new Pacific Salmon Treaty and related fishing plans for the major interception fisheries entered into force on 18 March 1985. Annexes to the treaty cover several fisheries: the Fraser River; the northern BC – southeast Alaskan boundary area; the chinook fisheries along the coasts of Alaska, BC, Washington and Oregon; the southeast Alaskan transboundary rivers; the Yukon; and the coho fishery in the southern area of BC. On the Fraser, a ceiling has been established on US interceptions, and management authority for Fraser River sockeye and pink will be passed from the International Pacific Salmon Fisheries Commission back to Canada. A rebuilding programme has been established for depressed chinook stocks, limits have been placed on interception fisheries in the northern boundary area and harvest shares have been agreed for the transboundary rivers in southeast Alaska. A commitment to early discussions on Yukon River harvest-sharing was also agreed.

Concern over the status of fish stocks in the North Atlantic was evident before 1939, but increased catches after the Second World War, and awareness of the dramatic increases in both the number and size of fishing vessels, led to the establishment of the International Commission for the Northwest Atlantic Fisheries (ICNAF) in 1949. ICNAF's early controls addressed the question of mesh size in order to limit the capture of small sizes of the desired species. Mesh-size control proved insufficient to protect the resource in the face of the massive increase in fishing pressure that occurred in the 1960s, and in 1970, ICNAF implemented the concept of Total Allowance Catches (TACs) for certain stocks. The recognition that the TACs were not preventing continued over-exploitation, coupled with the threat of extended jurisdiction, led ICNAF to adopt the concept of "$F_{0.1}$" fishing mortality. In its simplest form, $F_{0.1}$ means catching 85-90% of the maximum sustainable yield with two-thirds of the fishing effort, and also has practical benefits to the



Canadian observer aboard a foreign fishing vessel monitors the catch to ensure sustained utilization of marine resources.
M. Thérien, Department of Fisheries and Oceans.

fisheries. Used over the long term, fisheries management at $F_{0.1}$ will yield larger fish and stocks will show less variation in abundance, while allowing the stock to rebuild. In general, the changes in fishing pressure have already led to substantial recoveries for most groundfish stocks and for salmon. Regulation of tunas has been provided specifically through the Inter-American Tropical Tuna Commission and the International Commission for the Conservation of Atlantic Tunas, which Canada joined in 1968 and 1969 respectively. The Northwest Atlantic Fisheries Organization manages stocks outside Canada's 200 mile limit, and also the cross-boundary species. These include seals, squid, shrimp, salmon and mackerel (see *3n*).

Few attempts have been made to address the concerns for marine ecosystems even though, in the long run, it is ecosystems that support fishery resources. They include the London Dumping Convention, aimed at protecting the sea and its living resources from pollution (see *3i*). The Indian Ocean Sanctuary prohibits commercial whaling for the period 1979-89 in the area specified under provisions of the International Whaling Commission (IWC). Canada has been an active member of the IWC since 1946. Management and protection measures for beluga whales are under consideration in Canada; references to research and conservation of whales in their coastal habitat may be found in sections *1g* and the North.

Very significant concerns remain for international seas, and new issues continue to emerge. Prominent among these are the lack of a unified approach to conservation of whales, and the use of very long drift nets in the Pacific Ocean, which have increased drastically the incidental kill of sea mammals and unwanted fish species.

3i Implementation of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, of the Convention on the Regulation of Long-range Transboundary Air Pollution, and of analagous regional conventions

Under the 1979 Geneva Long Range Transboundary Air Pollution Convention, 20 countries (the 30% club) signed a sulphur dioxide abatement protocol in 1985, endorsing a proposal to reduce sulphur dioxide emissions by 30% by 1993. Canada is a member of the executive body of the convention and was a leader in the negotiations which led to the protocol.

In 1984 the federal government and the provinces concerned made a commitment to reduce sulphur dioxide emissions in eastern Canada by 50% of the 1980 level, i.e., by a total of 2.3 million tonnes per annum by 1994. This reduction in emissions is calculated to reduce the deposition of wet sulphates to 20 kg per hectare per annum – a target necessary to protect moderately sensitive lakes and streams. Achieving this target requires complementary actions in the US. In March 1985, federal and provincial environment ministers specified by how much each province east of the Saskatchewan-Manitoba border would reduce its sulphur dioxide emissions.

Finally, in March 1985 the comprehensive acid rain programme, including funding, was announced. This provided for:

a) tougher new motor vehicle emission standards (see *1f*).

b) guaranteed funding to assist in a domestic emissions clean-up programme ($150 million for emission controls at smelters, $25 million for technology development and $70 million to study cleaner, more efficient use of coal);

c) continuation of an extensive scientific research and monitoring programme ($18 million per year to 1989-90 for research and monitoring effects).

In 1975, Canada joined more than 50 other countries in ratifying the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter. This convention, often referred to as the London Dumping Convention, is a powerful weapon in the battle to protect the sea and its vital living resources, including food resources, from pollution. As signatory to the convention, Canada has met its international obligations by enacting the Ocean Dumping Control Act which provides for a comprehensive permit and inspection system for ocean dumping. As well, the Ocean Dumping Research Fund provides resources for scientific research into ocean dumping problems. Canadian scientists are also actively involved in various scientific advisory committees pursuant to the convention, which is currently chaired by Canada.

Canada has been a leading proponent of the Vienna Ozone Layer Convention, signed by 23 countries in 1985, and is currently preparing for formal ratification. The use of chlorofluorocarbons as in aerosol spray cans, and other ozone layer modifiers, has been banned for most applications in Canada. Further regulatory control options are currently under international discussion.

There is particular need for an international convention on greenhouse gases and their potential effects on global climate and ecosystems. Prospects for such a convention are being investigated by the World Meteorological Organization, the United Nations Environment Programme and the International Council of Scientific Unions. Canada is a world leader in studies on this topic and recently chaired a major international conference of experts (see *3h*).

Canada is also seeking development of a protocol for the reduction of nitrous oxide emissions, in addition to sulphur emissions.

3j Control of deep sea mining

Although the mining of aggregate and other minerals from the deep sea has the potential to impact locally upon fish and fish habitat, more important environmental concerns related to deep-sea mining stem from the extraction of oil and gas reserves. Oil and gas well blowouts or spills have the potential to damage ecological systems within the global marine environment.

In Canada, the Environmental Assessment and Review Process (*2f*) is used to assess the environmental implications and necessary contingencies for major projects involving federal initiatives, lands or money. Reviews have been carried out for the Beaufort Sea and more recently for the Hibernia field off the coast of Newfoundland, and for the west coast. Oil and gas exploration and development are regulated primarily through provisions of the Oil and Gas Production and Conservation Act, although there are several other legislative instruments that may be used for specific purposes, e.g., the Fisheries Act and the Ocean Dumping Act (*1f*). Environmental requirements are incorporated directly into licences, approvals and "authorities to drill" through the government's cooperative regulatory approach.

3k Support for the World Climate Programme

The combustion of fossil fuels has raised the carbon levels of the atmosphere to the point where significant climatic change now appears inevitable; the North is par-

ticularly susceptible. Since the late 1970s, haze formed by sulphates, soot and other pollutants transported from mid-latitude industrial regions has been noticeable throughout the Arctic. Although pollutant concentrations are comparatively weak, this arctic haze is a precursor of a global problem requiring international action.

During the past decade, there has been considerable concern about the loss of the thin ozone layer in the stratosphere which protects life from the sun's ultra violet rays. Some controls on the use of freon gases as aerosol propellants have been implemented in a few countries; however, these controls are only partially effective and the ozone layer is still in serious jeopardy. Oxides of carbon and nitrogen and other gases including methane and ammonia are also increasing progressively in the atmosphere. These may amplify the greenhouse warming due to carbon dioxide increases and induce other weather changes over the next century, which will greatly affect the environment in all regions of Canada.

Research into such issues is the main thrust of the World Climate Programme, supported in Canada through the Canadian Climate Programme (CCP). The CCP, endorsed by the Canadian Council of Resource and Environment Ministers in 1981, has developed contacts with environmental and economic sectors of the country through topical workshops (e.g., drought 1983), and through regional councils. This structure enables resource conservation interests in Canada to identify and develop responses to climate problems or beneficial anomalies. In October 1985, Canada sent strong representation to the international meeting at Villach, Austria, on the assessment of the role of carbon dioxide and other gases active in climate variations and associated impacts.

The CPP is directed by a planning board consisting of representatives of various federal and provincial government agencies and the universities; one national and various regional advisory groups recommend on programme content. National agencies and institutions regularly collaborate to address key issues. For example, perturbations to hemispheric-scale atmospheric circulations have encouraged the development of a three-dimensional general circulation model (GCM) by DOE which can replicate El Niño-type events. Here, DFO contributed the valuable oceanic circulation components to the model, improving its utility. Similarly, DFO has undertaken studies of the effects of climatic change on currents and sea temperatures and will assist DOE in assessing the implications of a one-metre rise in sea-level resulting from snow and ice melt in the polar regions.

The World Climate Research Programme (WCRP) has a large component of oceanographic research; effective climate forecasting climate is not possible without considerable improvement in knowledge of the general circulation of the oceans and the construction of coupled ocean-atmosphere models. The experiments of most immediate interest to Canada are the World Ocean Circulation Experiment (WOCE), the Tropical Ocean and Global Atmosphere Programme, and studies of the cryosphere. Canada plays a leading role in the Committee on Climate Change and the Ocean, the international committee which directs the oceanographic component of the WCRP and in organizing WOCE. Canada performs ocean data collection and research activities that contribute to the objectives of the WCRP.

A modern national data management system is being developed by the Canadian Climate Centre at Downsview, Ontario. The centre has introduced monthly and seasonal temperature and precipitation forecasts for Canada on an experimental basis. In addition, research on the problems of long-range transport of air pollutants and characteristics of other contaminants having part-time atmospheric residence has continued to receive major support as these may be associated with, or contribute to climatic change.

Joint research arising from federal-provincial water agreements has been enhanced by the opening this year of the National Hydrological Research Centre at Saskatoon. This institution will seek to integrate hydroclimatic information from time-scales extending from deglaciation to present, and make predictions for the future, with a special focus on recurring droughts in the prairies. The work will be guided by a recent federal water resources policy review, which encourages greater liaison with agricultural, forestry, wildlife, and other interests.

Other long-term climatic change studies are being supported through the Canadian Committee on Climatic Fluctuations and Man. Recently, the CCP has also sponsored university research to assess the effects of climatic change on the Great Lakes region and on agriculture in the prairies and Ontario. A collaborative project with the International Institute of Applied Systems Analysis in 1985 investigated the agricultural vulnerability of the cold margin climate, typified in central Saskatchewan.

3I Conservation of the living resources of Antarctica and the Southern Ocean

Antarctica and the Southern Ocean are to a large extent under the nominal control of the 13 parties of the Antarctic Treaty, which restricts use of the region to peaceful activities, in particular, scientific research, while freezing territorial claims from seven countries. The Southern Ocean has rich populations of krill, which are attracting attention as sources of protein. Krill are of paramount importance to the antarctic ecosystem, and support important populations of sea mammals, birds and

fish. International research programmes focus on the life-support role the Antarctic plays in global climatic and oceanic processes, and conservation of living resources.

Canada has not signed the Antarctic Treaty and does not have an official programme in Antarctica, although Canadian scientists have contributed to research in the region. The future of Antarctica is unclear, in view of the limited lifespan of the treaty. As a nation with sovereign interests in the Arctic, Canada would have much to gain and much to offer as a participant in international cooperative research in Antarctica, and in international planning for the future course of Antarctica.

3m Regional strategies for the conservation of the living resources of international river basins

Managing a watershed wisely can become more challenging if its waterways and aquifers happen to straddle an international boundary, as almost 300 Canadian watersheds do. Two-thirds of all Canadians live in basins shared with the US, including the Columbia, Yukon, Saint John and, the Great Lakes – St. Lawrence system. With an 8900 km border of which 3900 km is actual water, Canada and the US have risen to the challenge and established ways to manage their shared river basins. This section deals particularly with the Great Lakes – St. Lawrence system, recognized by the WCS as one of the priority biogeographical provinces.

There are eight significant treaties or agreements between Canada and the US, with the Boundary Waters Treaty of 1909 being one of the most important. It established the International Joint Commission (IJC) and set out the basic principles for guiding boundary waters relations between the two countries, primarily that each country has equal and similar rights to water on their side of the boundary. Each country appoints three members to the IJC which operates as a joint body to advise both countries on matters they have referred to it. So far, the IJC has conducted some 45 investigations to provide advice on, among other things, power production on the Poplar River, transboundary impacts of the Garrison Diversion, diversions and consumptive uses in the Great Lakes, high water levels on the Great Lakes and water quality in the Great Lakes (discussed in more detail below). The IJC is also responsible for approving and supervising dams, diversions, obstructions and remedial works that alter natural water levels at the boundary or back up water across the border and has dealt with about 32 such projects.

In most cases the two governments act on the IJC's advice; however, there are two weaknesses. First, the IJC is an advisory body which cannot enforce its recommendations. Second, the governments can avoid referring very contentious issues to it, e.g., acid rain; they have never asked the IJC to arbitrate a dispute although it has the authority to do so if requested under the Boundary Waters Treaty. Furthermore, the treaty is now dated and thus criticized for not being attuned to modern social and economic needs. For instance, it does not address fisheries and recreation issues and cannot deal effectively with pollution. Despite these shortcomings, both the treaty and the IJC have played valuable roles in managing joint watersheds along one of the world's longest borders. They are seen as a good example of international cooperation without which there would have been fewer cooperative projects, less consideration in unilateral developments and more strained relationships. For example, under the auspices of the IJC, New Brunswick, Maine, Canada and the US have cooperated on the management and protection of the international basins of the St. John and St. Croix Rivers. Technological achievements in flood control have been transferred to developing countries.

The Great Lakes make up the largest freshwater system in the world. Over 40 million North Americans live in the basin and millions more are affected by activities in it. It is one of the world's largest and most rapidly growing urban-industrial complexes. In Canada, the basin contains three-quarters of the country's industrial activity, almost two-thirds of the population and almost half the dollar value of Canadian agricultural production. The lakes supply one-third of our population with drinking water.

Industrial and other activities have had tremendous impacts on the Great Lakes. Eutrophication is vastly speeded up by sewage and phosphates. Acid rain and toxic chemicals are posing new hazards. Unfortunately, the lakes deteriorated before we became fully aware that action was needed. By the late 1950s, drinking water was threatened and public beaches were closing in Lakes Erie and Ontario; commercial and sport fisheries were in decline.

Canada and US signed the first Great Lakes Water Quality Agreement in 1972. Action against phosphates and untreated municipal sewage was launched with a massive sewage treatment programme. In Canada, $991 million was spent on or committed to construction of sewage treatment facilities, and the use of phosphates in household detergents was limited. Rapid strides were made in the US, but some major centres such as Niagara Falls still lack proper treatment facilities. Nevertheless, there has been dramatic progress in curtailing phosphates and the rate of eutrophication has been reduced.

In 1978, the agreement was renewed and amended giving more emphasis to newer problems. It now sets water quality objectives for about 30 chemicals, and commits the two countries to eliminating discharges of

persistent toxic substances and establishing early warning systems to anticipate problems associated with them. Canada spends $10 million per year monitoring and diagnosing the condition of the Great Lakes, paying special attention to toxics, as part of the cooperative Great Lakes International Surveillance Plan. However, the most significant feature of the amended agreement is that its general objectives apply to *the entire Great Lakes ecosystem* not just the boundary waters.

Despite the good will and progress made by the Canadian and American governments, the agreement does not empower the two senior governments to enforce its terms on other levels of government or the private sector. Successful implementation depends on federal legislation designed for nation-wide application. In Canada, this has not caused difficulty. The province of Ontario has been very supportive of efforts to improve Great Lakes water quality (see *1d*).

In 1985, Ontario, Quebec and eight states bordering the Great Lakes signed the Great Lakes Charter; the charter provides for the protection and conservation of lake levels and flows, through cooperative management. In 1986, Ontario, New York, Canada and the US reached agreement on a Niagara River toxic clean up programme.

There is much work that remains to be done, in control of contaminants from agriculture, forestry and other land use activities, in development of safe dredging operations (dangerous contaminants have settled to the lake bottoms) and in control of airborne pollutants. The future looks promising for the Great Lakes and other international basins. Citizens on both sides of the border are pressing for wise management of their shared water resources. For over 75 years, the two senior governments have had mechanisms in place to manage cooperatively transboundary waters, and they have used them. And more importantly, by incorporating it in the Great Lakes Water Quality Agreement, both governments have officially recognized the need to treat river basins as part of an ecosystem that must be managed as a whole.

3n Regional strategies for the conservation of the living resources of international seas

The last priority action recommended by the WCS draws attention yet again to the importance of international efforts to conserve marine resources.

Some of the most difficult conservation problems arise with living resources of the sea, because of their great mobility (generally unseen), the diversity of fishing and other pressures brought to bear on them, the difficulty of acquiring adequate scientific information, and the difficulty of monitoring utilization and implementing regulations on the high seas.

The expansion in fishing off the Canadian coast by other nations in the 1960s and 1970s and the associated decline in fish stocks became increasingly unacceptable to Canada. At the Third United Nations Conference on the Law of the Sea, convened in 1973, the concept of enlarged, exclusive fishing zones was given serious consideration, and it was found that the concept was gaining popular acceptance in the international community.

As a result, Canada proclaimed an exclusive fishing zone of 200 miles on 1 January 1977. We became responsible for an offshore area amounting to one-third of the size of our total land mass. The role of managing the fisheries within this zone became entirely the responsibility of Canada, as a coastal state, whereas in the past it had been an internationally shared responsibility.

Differences between the US and Canada, over the management of transboundary stocks on the east coast, have led to difficulties in developing a common management strategy. Additionally, a portion of the Grand Bank, off Newfoundland, extends beyond 200 miles and suffers from the lack of conservative management measures and efficient enforcement. Canada has six international maritime boundaries, four with the US, one with France, and one with Greenland, making the management of transboundary stocks particularly difficult.

CONCLUSIONS

Canada's achievements in conservation are considerable. Much has been accomplished through the foresight of governments, industry and NGOs; individuals, too, have played their part, as inspirational and intellectual leaders in places of learning and in the public domain. Not all will agree with the positive tone that pervades this report, arguing that sustainable development has yet to be achieved in Canada. These criticisms have some basis, because serious obstacles still impede realization of the objectives of the World Conservation Strategy.

Clearly, Canada is not among those countries where legislation barely exists to regulate, protect and maintain living resources, where only fragments of original gene pools remain, or where people are destitute through the absence of conservation measures. But, it may be argued that we have rested too much on our laurels: on legislative and regulatory instruments, of which we have many, and on policies and programmes for resource management and utilization. What is needed now is a concerted programme of conservation actions that draws on the strengths we have established.

It may also be argued that these accomplishments are unintended handicaps as we strive for a true conservation strategy in Canada. The World Conservation Strategy is quite explicit: one of the main obstacles to achieving living resource conservation is the belief that it is a limited sector, rather than a process that is cross sectoral by nature. By the same token, our sectoral policies, with laudable conservation objectives, tend to polarize attention and action to the individual resource sectors with insufficient regard for their interrelatedness. The WCS recognizes such policies as essential steps in safeguarding the sustainable utilization of resources; but these policies do not, in sum, constitute a conservation strategy for a nation, province or territory. An effective conservation strategy must be cross sectoral and, in Canada especially, this also means that it must cross jurisdictions. Life-support systems and living resources show little regard for the arbitrary domestic or international boundaries we have chosen for ourselves.

There are other obstacles facing us. Management of Canada's resources has placed heavy demands on the available knowledge base. Again by sector, we have established significant educational, scientific and technological institutions. Yet even these have not been enough for us to prevent serious resource problems from arising: the continuing degradation of western prairie soils provides a vivid example of the crucial issues now facing this country. The growing realization that sustained development is to be attained only through a fully integrated approach to resource management and utilization, presents an even greater challenge to these institutions, and is one for which Canada is not fully prepared.

There is no doubt that more information is needed on the status of our living resources, and on their responses to the stresses we place on them. But, as agencies from all jurisdictions and representatives of all sectors register their concerns for more research, technology and education, care must be taken to ensure that the step forward is a concerted step, within a strategic framework that embodies conservation as its fundamental principle.

Canada has witnessed a remarkable evolution in public awareness and attitudes towards living resources and their conservation. Communications media have paid a great deal of attention to politically significant issues such as acid rain, certain west coast land-use controversies, and deteriorating water quality in the Great Lakes. Governments and NGOs in particular have put much effort into education, interpretation and information programmes. Nevertheless, a conservation ethic is far from being firmly established, in public and private sectors. Economic factors have retained their profile as the principal motivators of development. Governments and individuals still find compelling reasons to address immediate or short term needs that may be inconsistent with sustainable development. The urgent need to establish conservation within our cultural and economic systems remains. One encouraging sign is the increas-

ing acceptance of the user-pay principle in resource utilization.

The failure to integrate conservation with development is regarded as a major difficulty in the WCS. Canada has not fully overcome this difficulty. At the same time, we do not suffer significantly from other serious obstacles noted in the WCS: we have the capacity to conserve through our institutional framework although this framework tends to be unconnected at present; we do not lack support for conservation, although there is still much to be done to promote awareness of its benefits; and our development process cannot fairly be described as inflexible and needlessly destructive, although we have examples of both from the past and even today in some areas.

There are many elements of Canadian society and its infrastructure that will impede conservation. Financial restraint has affected important supporting activities by governments, including research into living resources, monitoring of environmental changes and contamination, and public awareness programmes. Restraint has been felt by certain groups of individuals, especially farmers, causing them to adopt measures that are undesireable in the long run. Land-use zoning and its control are complicated by traditional concepts of land ownership and rights associated with them, and by lack of articulated strategies for growth and development.

In the absence of integrated planning, a pattern of incremental decision-making emerges that can frustrate conservation objectives. The complexity and uncertainty of decision-making processes discourage needed public participation and induce groups and individuals to tend to their more narrowly focussed needs and desires. Our use of resources needs a context that fosters a social awareness of the role of humans in the environment, if conservation is to be accepted as being in the best interests of all, both now and in the future.

This report shows an encouraging commitment to deliver conservation-based development where it is most needed, notably in the rural areas of developing countries, although the WCS still regards failure in this task as a major obstacle to progress. Canada is also playing its part in conserving the global commons – the resources of the atmosphere and open oceans in particular. However, the failure of different nations to agree on the fundamentals of issues of mutual concern continues to constitute another serious difficulty for world conservation objectives.

As has been pointed out earlier, Canada does not have a national conservation strategy. A profusion of resource policies and strategies, a multiplicity of national and subnational policies and programmes, and the emergence of major cross-sectoral issues, some of them of international significance, suggest that a national strategy should be given consideration. The argument for such an undertaking is supported by Canada's leadership, often exemplary and unsolicited, in international affairs. Canada is deeply involved in international conservation activity, not only through sharing responsibilities for scientific research and technological information, but also through bilateral and multilateral assistance, and international conventions. We cannot convincingly recommend difficult yet rational courses of action for other nations without setting an example at home. Whether the World Conservation Strategy presents an acceptable model for a Canadian national strategy is a question for all to consider. Since a national strategy will of necessity embrace all elements of society, a decision on the next step should be subject to full public review and participation.

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ABBREVIATIONS

ASEAN	Association of South East Asian Nations
CCELC	Canada Committee on Ecological Land Classification
CCFM	Canadian Council of Forest Ministers
CCP	Canadian Climate Program
CCREM	Canadian Council of Resource and Environment Ministers
CDA	Agriculture Canada
CIDA	Canadian International Development Agency
CITES	Convention on International Trade in Endangered Species of Flora and Fauna
CLI	Canada Land Inventory
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Department of Fisheries and Oceans
DINA	Indian and Northern Affairs Canada
DOE	Environment Canada
DOT	Transport Canada
EARP	Environmental Assessment and Review Process
ECPGR	Expert Committee on Plant Gene Resources
FAO	Food and Agriculture Organization of the United Nations
FEARO	Federal Environmental Assessment and Review Office
FPLU	Federal Policy on Land Use
HWC	Health and Welfare Canada
ICC	Inuit Circumpolar Conference
ICL	Interdepartmental Committee on Land
ICNAF	International Commission for the Northwest Atlantic Fisheries
IDRC	International Development Research Centre
IJC	International Joint Commission
IUCN	International Union for the Conservation of Nature and Natural Resources
IWC	International Whaling Commission
NGO	non-government organization
NWT	Northwest Territories
OECD	Organization for Economic Cooperation and Development
PGRC	Plant Gene Resources of Canada
UNEP	United Nations Environment Programme
Unesco	United Nations Educational, Scientific and Cultural Organization
US	United States
WCRP	World Climate Research Programme
WCS	World Conservation Strategy
WOCE	World Ocean Circulation Experiment
WRI	World Resources Institute
WWF	World Wildlife Fund

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